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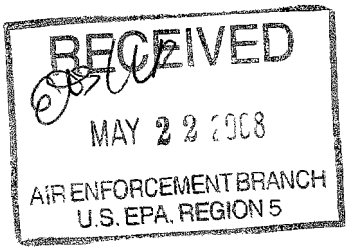
ENVIRONMENTAL SERVICES

May 23, 2008



Cheryl L. Newton, Acting Director
Air and Radiation Division
United States Environmental Protection Agency
Region 5
77 West Jackson Blvd.
Chicago, IL 60604-3590

RE: Veolia ES Technical Solutions, L.L.C.
Metals Performance Test Plans for Incinerators 2,3 and 4

Dear Ms. Newton,

Pursuant to our agreement, attached is the Metals Performance Test Plan Prepared for the Fixed Hearth Incinerator Number 2 in Accordance with 40 CFR § 63 Subpart EEE, Metals Performance Test Plan Prepared for the Fixed Hearth Incinerator Number 3 in Accordance with 40 CFR § 63 Subpart EEE and Metals Performance Test Plan Prepared for the Rotary Kiln Incinerator Number 4 in Accordance with 40 CFR § 63 Subpart EEE. Electronic copies of these plans have been sent to Mr. Charles Hall of your Agency on May 22.

Please call me at (618) 271-2804, ext. 101 if you have any questions.

Sincerely,

Doug Harris

Doug Harris
General Manager

#7 Mobile Avenue, Sauget, IL 62201
(618) 271-2804
www.veoliaes.com

Prepared for:
Veolia ES Technical Solutions
7 Mobile Avenue
Sauget, IL 62201

Metals Performance Test Plan Prepared for the Fixed Hearth Incinerator Number 2 in Accordance with 40 CFR § 63 Subpart EEE

ENSR Corporation
May 2008
Document No.: 10002-022

ENSR | AECOM

Prepared for:
Veolia ES Technical Solutions
7 Mobile Avenue
Sauget, IL 62201

Metals Performance Test Plan Prepared for the Fixed Hearth Incinerator Number 2 in Accordance with 40 CFR § 63 Subpart EEE

Prepared By Jeff Gorman

Reviewed By Craig Doolittle

ENSR Corporation
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1.0 Introduction

1.1 Program Summary [40 CFR § 63.1207(f) and § 63.7(c)(2)(i)]

This document is the Performance Test Plan for Incinerator No. 2 operated by Veolia ES Technical Solutions (Veolia) at its Sauget, Illinois facility. Since the Veolia incinerator treats certain waste that are classified as hazardous under state and/or federal regulations, this unit is subject to the requirements of the HWC MACT Rule.

This Plan has been prepared in accordance with requirements initially promulgated in **NESHAPS: Final Standards for Hazardous Waste Air Pollutants for Hazardous Waste Combustors,** (generally referred to as the Hazardous Waste Combustor [or "HWC"] MACT Rule). These regulations were initially published by US EPA on September 30, 1999 in 40 CFR § 63 Subpart EEE. However, these initial regulations were vacated based on a DC Circuit Court ruling, were subsequently replaced by "Interim Standards" in February of 2002 and then re-promulgated again in the Permanent Replacements Standards published in the Federal Register on October 12, 2005.

This document addresses the requirements to develop and submit a Performance Test Plan set forth in 40 CFR § 63.1207 and § 63.7. This test plan is written to address all applicable Subpart EEE (and General Provisions) requirements incorporated into the regulations through promulgation of the Final Replacement Standards published in the Federal Register on October 12, 2005.

1.2 Facility/Unit Identification

1.2.1 General

As mentioned above, this Performance Test Plan has been developed to evaluate the incinerator at the Veolia facility in Sauget, IL. This is a commercial hazardous waste incineration facility that treats liquid and solid wastes that are classified as both hazardous and non-hazardous.

1.2.2 Facility ID, Mailing Address, and Primary Contacts

The facility address is:

Veolia ES Technical Solutions
7 Mobile Avenue
Sauget, IL 62201
Facility ID#: ILD098642424

The facility contact is:

Mr. Dave Klarich
Phone: 361-572-2317
Email: David.Klarich@veoliaes.com

1.2.3 Incinerator Overview

This Veolia incinerator is a fixed hearth incineration system with primary and secondary combustion chambers that treats solid wastes as well as aqueous and organic liquids. The process is monitored and controlled by a distributed control system (DCS) capable of continuously monitoring the process to assure all operational parameters are within regulatory and permit limits while waste is being fed to the unit. In addition, this incinerator is equipped with a Continuous Emissions Monitoring System (CEMS) that continuously samples the exhaust gases for oxygen and carbon monoxide in the stack gas exhaust stream.

1.3 Purpose and Objectives of the Performance Test

1.3.1 General

The purpose of this test program is to validate the performance level of the incinerator against the requirements in 40 CFR Part 63, Subpart EEE. To this end, the specific objectives of this performance test are to:

- Demonstrate that the metals emissions from the incinerator meet the HWC MACT emission limits while treating hazardous waste for the parameters being tested.
- Collect monitoring data in order to re-establish operating parameter limits (OPLs) or set new OPLs on key operating variables that will ensure that the incinerator operates within the HWC MACT emission limits while treating hazardous waste.
- Utilize an extrapolation procedure, as appropriate, to establish metals feed rate limits.

The test program will include feeding a variety of liquid and solid waste materials to the incinerator, sampling and analyzing the feed streams, monitoring certain process parameters and conducting emissions testing. The emissions standards that will be evaluated under the HWC MACT regulations are summarized in **Table 1-1**.

1.4 Performance Test Plan Organization

This test plan has been organized in a format typically used for compliance demonstration test programs. **Table 1-2** is included so that the requirements in the HWC MACT rule can be cross-referenced with the sections in this Plan. The remainder of the document has been organized as follows:

- **Section 2.0** provides a general physical description of the fixed hearth incineration system and associated unit operations (including the air pollution control system) as well as an overview of the automatic waste feed cutoff (AWFCO) system and maintenance procedures.
- **Section 3.0** presents a brief discussion of the wastes to be treated in terms of physical and chemical parameters which impact thermal oxidation and summarizes the hazardous air pollutants presently identified in the waste streams.
- **Section 4.0** presents the Test Protocol including planned feed and test conditions, rationale for the test design, anticipated test schedule and final report format.
- **Section 5.0** fully describes all sampling and analysis procedures and associated QA/QC protocols following the latest EPA guidance. This section essentially serves as the Quality Assurance Project Plan (QAPP) for this project.

The Appendices contain Process Flow Diagrams (**Appendix A**), examples of performance test field data sheets and test equipment calibration (**Appendix B**); and isokinetic sample train setup and recovery forms (**Appendix C**).

Table 1-2 Cross Reference of Performance Test Requirements

Topic	Regulatory Citation	Section No. in this Document
Program Summary	40 CFR § 63.1207(f) and § 63.7(c)(2)(i)	1.1
Test schedule	40 CFR § 63.1207(f), (f)(1)(v) and § 63.7(c)(2)(i)	4.7
Data Quality Objectives (DQOs)	40 CFR § 63.1207(f) and § 63.7(c)(2)(i)	5.5
Internal and External Quality Assurance Plan	40 CFR § 63.1207(f) and § 63.7(c)(2)(i)	5.9 & 5.13
Analysis of feedstreams (as fired)	40 CFR § 63.1207(f)(1)(i)	3.0
Heating value, ash content, semi-volatile metals, low volatile metals, mercury and total chlorine	40 CFR § 63.1207(f)(1)(i)(A)	
Viscosity	40 CFR § 63.1207(f)(1)(i)(B)	
Identification and quantification of reasonably expected HAPs	40 CFR § 63.1207(f)(1)(ii)(A) & (B)	
Detailed engineering description of combustor		2.0
Manufacturer/make/model of HWC	40 CFR § 63.1207(f)(1)(iii)(A)	2.2
Type of HWC	40 CFR § 63.1207(f)(1)(iii)(B)	2.2
Maximum design capacity	40 CFR § 63.1207(f)(1)(ii)(C)	2.2
Feed systems	40 CFR § 63.1207(f)(1)(iii)(D) & (E)	2.3
Location of combustion zone temperature device	40 CFR § 63.1207(f)(1)(xix)	2.2.6
	40 CFR § 63.1207(f)(1)(iii)(F)	2.5.1
Hazardous waste AWFCO system	40 CFR § 63.1207(f)(1)(iii)(G)	2.4.11
Design, operation and maintenance of APC	40 CFR § 63.1207(f)(1)(xvii)	N/A
Justification of alternative gas flow rate measurement technique	40 CFR § 63.1207(f)(1)(iii)(H)	2.6
Design, operation and maintenance of stack gas monitoring systems		
Description of Waste handling and blending Operations	40 CFR § 63.1207(f)(1)(ii)(C)	2.3.5
Detailed test protocol including:		
Description of sampling, monitoring and analytical procedures	40 CFR § 63.1207(f)(1)(iv)	5.6 & 5.8
Description of Planned Feed and Operating conditions during the Performance Test	40 CFR § 63.1207(f)(1)(vi) & (vii)	4.3, 4.4 & 4.5
Procedures for rapidly stopping hazardous waste feed and controlling emissions during malfunction	40 CFR § 63.1207(f)(1)(viii)	2.3.6
Determination of hazardous waste residence time	40 CFR § 63.1207(f)(1)(ix)	2.2.7
Metal feed rate limit extrapolation (if used)	40 CFR § 63.1207(f)(1)(x)	4.4.2
Documentation of expected levels of regulated constituents in other feed streams that are not analyzed	40 CFR § 63.1207(f)(1)(xi)	3.0
Documentation of conditioning time needed to reach steady state prior to testing	40 CFR § 63.1207(f)(1)(xii)	4.6
Alternative monitoring frequency for wet scrubbers (if used)	40 CFR § 63.1207(f)(1)(xxiii)	N/A
Other information deemed necessary by the agency	40 CFR § 63.1207(f)(1)(xxvii)	-

2.0 Engineering Description

2.1 Process Overview

Veolia operates 2 Fixed Hearth Dual Chambered Incinerators (Units 2 and 3) and one rotary kiln incinerator (Unit 4) at the Sauget, IL facility. The two fixed hearth units are rated at 16 million Btu/hr each. Incineration Unit No. 3 is a mirror image of Unit No. 2. Both of these units have their own waste handling systems as described in the sections that follow. The only difference being Unit No. 2 is equipped with four (4) baghouse modules, while Unit No. 3 is equipped with three (3) baghouse modules. However, each incinerator is operated identically with only three baghouse modules in service during operation.

2.2 Waste Feed Systems [40 CFR § 63.1207(f)(1)(ii)(c) and (f)(1)(iii)(D) and (E)]

2.2.1 Unit 2 Liquid Waste Feed System and Blending Operations

The fixed hearth incinerator is designed to receive containers, aqueous liquid wastes, organic liquid wastes, specialty liquid feeds, gases and direct inject liquids fed through the aqueous or organic liquid feed systems. These units can receive any combination of wastes -- liquid, semi-solid, solid or gases -- with a heat value of up to 16 million Btu/hr.

Unit 2 is supported by storage/blend tanks located in Tank Farm #1. Rates of feed are controlled at each incinerator. Segregated liquid wastes are stored until utilized in the waste blending facilities. At that time, liquids are delivered to the blending tanks where the daily liquid feed to the incinerator is formulated, tested, and released to the incinerator. Blending of stored liquid wastes to achieve optimum heating value and viscosity for incineration takes place in Tanks 2, 4, 6 & 8. Six additional tanks (10, 20, 30, 40, 50 & 60) are used to segregate different waste stream types for blending of liquid feed to the incinerator. Several criteria are important in designing a blend from available wastes that have been segregated principally by physical and chemical properties. These include compatibility, proper range of heating value, and permit restrictions regarding elemental composition (based on emission limitations). The material is transferred through aboveground pipelines from the tank farm to the incinerator. Pipelines used to transfer liquid organic waste and aqueous waste are equipped with strainers.

In compliance with the Benzene NESHAP, all tanks are vented to individual carbon adsorption canisters for removal of organics before vapor is discharged to the atmosphere. Each carbon adsorber canister is essentially equivalent to a 55 gallon container or greater, if necessary. All tanks are equipped with conservation vents, in addition to the carbon canister adsorber. All tanks are grounded, and flame arrestors are installed between the carbon adsorbers and the tanks.

2.2.1.1 Organic and Aqueous Liquid Waste Feeds

The liquid waste injectors used in the combustion chambers are air-atomizing injectors. These are used for injection of high Btu, low Btu liquids and specialty feed liquids. Dual fluid injection nozzles will be used for atomization of the waste. Each of the injectors is rated at 0-300 gph. The liquid waste feed nozzles are served by parallel redundant pumps and recirculation systems with back pressure control.

2.2.1.2 Packaged and Bulk Solid

Containers of wastes are sampled and analyzed after receipt in accordance with the facility's Waste Analysis Plan. These wastes can then be delivered directly to Unit 2 or repacked into small combustible containers at the facility. Fiberboard or plastic containers (fully or partially full of waste), up to 40-gallon size, may be charged directly to the primary chamber. These will be received at the dock adjoining each fixed hearth incinerator, and charged to the incinerator within 24 hours or returned to permitted storage.

Solids, usually packaged in plastic or fiberboard containers, are introduced into the incinerator through a PLC controlled airlock-ram system located at the lower front of the primary chamber of the incinerator. The airlock is composed of a refractory-lined door, a door into the airlock enclosure, and two pneumatic rams. The action of the feeder is as follows:

- With the incinerator door closed, the airlock door is opened.
- The first pneumatic ram (load ram) pushes weighed charges of waste into the airlock chamber.
- The airlock door is closed.
- A switch is activated either automatically or manually, which opens the door to the incinerator and actuates the ram (charge ram) that pushes the waste into the incinerator. The ram then retracts and the incinerator door closes.

2.2.1.3 Specialty Liquid Feeds and Gases

Specialty Feed Systems associated with Incinerator No. 2 are as follows

- Specialty Feeder
- Compressed Gas Cylinder Feed System
- Direct Inject Liquid Feed System

2.3 Manufacturer, Make and Model of the Incinerator [40 CFR § 63.1207(f)(1)(iii)(A)]

2.3.1 Combustion Chamber and Burners [40 CFR §63.1207(f)(1)(iii)(B) and (C)

Incinerator No. 2 features a two-stage combustion process. Ignition of waste material takes place in the primary (lower) combustion chamber (PCC). A secondary (upper) combustion chamber (SCC) serves as an "after-burner" for process gases. Ignition of the waste takes place at temperatures in excess of 1700 degrees F. The secondary combustion chamber maintains a minimum temperature of approximately 1800 degrees F.

The fixed hearth incinerator is fabricated of carbon steel. The primary chamber has an external diameter of 9 feet and is 17.5 feet long. The interior walls of the chamber are lined with approximately 10 inches of brick refractory and insulation backing, making the internal operating diameter approximately 7'2". The cross-sectional area of the chamber is thus 40.3 square feet. Table 2-2 provides a summary of the incinerator design specifications.

Liquid and solid waste feeds enter the lower chamber on the front-face of the chamber. The primary burner and the specialty feed injector are located near the front-face of the chamber and are mounted tangentially.

The primary burner is a North American burner rated at 12.0 million Btu/hr. and is used in the lower chamber to maintain permitted temperatures. It will burn only natural gas or No. 2 fuel oil. The burner system is supplied with combustion air at a static pressure of 30" water column (WC). The pilot for the primary burner will burn natural gas.

The fuel system for the lower chamber (and secondary combustion chamber) is controlled by a Factory Mutual approved burner management system complete with interlocks and safety valves.

2.3.2 Secondary Combustion Chamber

The secondary combustion chamber (SCC) is a horizontal, cylindrical chamber that has an external diameter of 9 feet and is 17.5 feet long. The interior walls of the chamber are lined with approximately 10 inches of brick refractory and insulation backing, making the internal operating diameter approximately 7'2". The cross-sectional area of the chamber is thus 40.3 square feet.

Following ignition of the waste material under controlled or starved-air conditions in the lower chamber, off-gases travel through a refractory-lined flue gas passage into the upper chamber, which acts as an afterburner. Turbulence is achieved by the tangential introduction of air and additional fuel in the upper chamber.

The SCC is equipped with one burner mounted tangentially on the side of the chamber. The burner is a North American burner rated at 6.0 million Btu/hr and is fueled with natural gas or fuel oil.

As with the primary chamber burner, the SCC burner is supplied with atomizing air and is equipped with a burner management system. This system controls the ignition and initiates an automatic shutoff when there is a loss of flame, combustion air supply, fuel pressure, atomizing air pressure, or pilot burner.

Leaving the upper chamber, the hot gas stream travels through 28 feet of refractory-lined stack sections before reaching the start of the gas scrubbing system. The combined volume of the upper and lower chambers, the flue gas passage and the hot crossover section is approximately 1,567 cubic feet. The total retention time of combustion gases within the system is approximately 5 seconds.

2.3.3 Location of Combustion Zone Temperature Device [40 CFR § 63.1207(f)(1)(xix)]

The thermocouple that monitors temperature in the primary combustion chamber is located on top of the chamber about five feet from the transition. The thermocouple that monitors temperature in the SCC is located on top of the chamber above the transition.

2.3.4 Hazardous Waste Residence Time [40 CFR § 63.1207(f)(1)(ix)]

The Hazardous waste gas residence time for the Fixed Hearth Incinerator is calculated as follows:

- Primary Combustion Chamber Volume – 635 ft3
- Secondary Combustion Chamber Volume – 635 ft3
- Total Volume – 1270 ft3
- Maximum Flue Gas Flowrate – 17,382 acfm (290 ft^3/sec)
- Total Combustion Zone Residence Time = (1270 ft^3)/(290 ft^3/sec) = 4.4 sec

2.3.5 Combustion System Leak

Combustion system leaks are prevented through maintaining a totally sealed combustion chamber, coupled with the use of an induced draft fan that maintains a vacuum of normally - 4 to - 6 inches of water column in both combustion chambers while wastes are being fed to the unit.

2.3.6 Emergency Safety Vent

The incinerator is equipped with an emergency safety vent (ESV) located at the top of the secondary combustion chamber. This ESV is a refractory-lined emergency thermal relief vent (TRV) which is held in the closed position by a pneumatic cylinder. The control valve in the line supplying air to the cylinder and the cylinder vent valve which opens the TRV are located in the control room for each unit. Valve locks (with keys attached) are utilized to deter indiscriminate operation of these valves. Opening of the TRV allows hot combustion gas to vent from the combustion system during emergency shutdown events. The purpose of the TRV is to protect the downstream APCS from excessive temperature situations. A limit switch on the TRV shuts off all waste feeds to the system as it senses that the cap is opening.

2.4 Procedures for Rapidly Stopping Hazardous Waste Feed During Equipment Malfunction [40 CFR §63.1207(f)(1)(viii)]

Equipment malfunctions are identified by the control system, observation of process control variables, or by regular field inspections.

In the event of minor equipment malfunctions (e.g. waste feed or scrubber leaks), the control room operator will be notified. The control room operator will then close the waste feed valves and disable the waste feed pumps.

In the event of major equipment malfunctions (e.g. fire), the emergency stop button located in the control room will be pushed. If this button is pushed, all equipment will switch to its fail-safe position.

2.5 Air Pollution Control Equipment [40 CFR §63.1207(f)(1)(iii)(G)]

2.5.1 Air Pollution Control Systems Descriptions

The air pollution control system consists of a spray dryer absorber and fabric filter baghouse modules. The air pollution control system neutralizes acidic compounds and removes particulate from the exhaust gas. Two subsystems, the spray dryer absorber and the fabric filter, carry out the chemical neutralization and particulate removal functions, respectively. A third subsystem, the lime system, is used to prepare and provide lime slurry to the spray dryer absorber for use in the chemical neutralization process. The induced draft fan and stack provide the mechanical energy required to transport the flue gas through the interconnecting ductwork, to its eventual discharge point to atmosphere.

2.5.1.1 Lime System

The lime system prepares lime slurry for use in the chemical neutralization process in sufficient supply and concentration to maintain continuous flue gas treatment in the spray dryer absorber. The system has been designed for batch mixing to provide this service.

Hydrated lime is stored in a storage bin above the lime preparation area. The storage bin is sized to hold enough hydrated lime to maintain several days of system operation at the maximum combustion rate of the incinerator. Lime is discharged through the conical storage bin bottom. The flow of the material from the bin is aided by a vibrating "live bottom," or bin activator. A variable speed screw feeder is used to meter the hydrated lime in the proportions required for batch mixing lime slurry. The lime is mixed with water in a tank beneath the lime storage bin. The screw feeder speed and the rate that water is added to the lime slurry tank are variable so that the desired lime solids concentration can be achieved in the tank. The variable feed adjustments allow water and lime to be added to the lime slurry tank at a rate that will allow a batch mode of mixing. An agitator is provided in the slurry tank to mix the water and lime and to maintain the suspension of lime solids. The mixed lime slurry is pumped at a continuous rate of flow through a recirculation loop to the atomizer.

2.5.1.2 Spray Dry Absorber

Unit 2 is equipped with a Spray Dryer Absorber (SDA) located immediately downstream of the secondary combustion chamber. The SDA unit is fabricated of 3/8 inch carbon steel. The function of the SDA is to:

- Further cool the combustion gases from 1600-2000oF to 300-500oF,
- Neutralize and remove HCl and other acids from the combustion gases,
- Remove a portion of the particulate (fly ash) from these gases.

Slurry flow to the spray dryer absorber (SDA) is metered by a flow control valve to obtain the proper feed concentration to the spray dryer absorber atomizer. Automatic (or manual) adjustment to the flow is made as a function of the output from a hydrochloric acid (HCl) analyzer in the gas duct downstream of the fabric filter. The amount of slurry metered is proportional to the amount of HCl monitored.

The slurry passes through a stationary swirl-type liquid distributor into the atomizer wheel where induced centrifugal force from the rapidly spinning wheel discharges the slurry through the wheel nozzles at high velocity. The design of the atomizer wheel, its rate of spin, and the discharge velocity of the slurry, create a cloud of finely divided droplets around the periphery of the atomizer wheel. A feedback signal from the atomizer power transmitter provides verification that water flow to the atomizer increases or decreases in proportion to the spray dryer absorber outlet temperature.

Flue gas enters from the bottom of the spray dryer absorber through a vertical, centrally located disperser. The disperser directs the flue gas through the zone filled by the atomized slurry cloud where the flue gas and slurry mix and most of the absorption occurs. The gases then flow downward through the absorber chamber and exit through a bottom side duct. As the gases contact and pass through the cloud of atomized lime slurry, the water in the slurry evaporates, cooling the gases. Simultaneously, the lime in the slurry reacts with the hydrogen chloride in the gases to produce calcium salts. Some of the resulting dry material, consisting of calcium salts, fly ash and excess lime, falls to the conical bottom of the unit. The dry material from each unit is discharged to a conveyor system which transports it to a dump trailer or equivalent type system.

2.5.1.3 Fabric Filter

Gas exhausted from the spray dryer absorber is distributed by manifold ducts to four fabric filter modules. The unit is operated with only three modules on-line with the fourth module off-line in a standby mode. Within each filter module, the gas is passed through Teflon-coated fiberglass cloth bags. The gas passes from the outside to the inside of the filter bags. Particulate entrained in the gas stream is mechanically deposited on the outside of the filter bags as the gas passes through the cloth.

Each module has a clean air plenum and housing section to contain approximately 96 bags. Each bag is approximately 6" in diameter by 20' long. The baghouses are fabricated from 3/16" mild steel plate, of welded construction, gas tight and stiffened to withstand the maximum operating negative pressure. Each compartment has a tube sheet that supports the bags and provides for top bag/cage removal. Access to the clean air plenum is via a side access door in the clean air plenum.

The fabric filter cleaning mechanism utilizes jets of air to clean the filter bags. Periodically, the cleaning sequence will be initiated. The sequence is started at the end of a 4 hour timed cycle, when the differential pressure across the filter reaches a predetermined setpoint of approximately 7.0" w.c., or when the operator initiates a cycle. The controller then sequences to each row of filter bags in each module, releasing a burst of air opposite to the direction of gas flow. The quickly released burst of air dislodges dust cake on the exterior of each bag as it travels from the top to the bottom of the bags. Released from the bag, the dust cake falls by gravity into the hopper at the bottom of the module. From there it is discharged to a conveyor system which transports it to a dump trailer, or equivalent type system.

Treated by the spray dryer absorber and filtered by the fabric filters, the cleaned flue gas exits the fabric filter modules to an outlet manifold for exhaust.

2.5.1.4 Induced Draft Fan and Stack

The induced draft fan and stack are located downstream of the fabric filter. Combustion gases are drawn through the system by a 75 hp induced draft (ID) fan, rated at 15,000 acfm at 400° F saturated, and 22" water column pressure. The induced draft fan provides the mechanism for transporting the incinerator flue gas through the spray dryer absorber, fabric filter, and all interconnecting ducts. The ID fan includes an inlet volume control damper to be used to control the velocity of the gas within the ducting and treatment devices.

Treated gases are exhausted from the induced draft fan to the atmosphere through a 90-ft. high stack. The stack diameter for Unit 2 is 39 inches I.D. The stack is equipped with instrument sampling ports and a sampling platform for emissions testing. Figure 5-1 provides details on the design and sample port locations and configurations for the stack.

2.6 Stack Emissions Monitoring [40 CFR §63.1207(f)(1)(iii)(H)]

The continuous emissions monitoring (CEM) system consists of sample probes, sample delivery and conditioning apparatus, and gas analyzers. Samples are extracted from the sampling ports on the stack. A CEM performance test and quality assurance program has been implemented in accordance with **Performance Specifications for Continuous Emission Monitoring of Carbon Monoxide and Oxygen for Incinerators, Boilers and Industrial Furnaces Burning Hazardous Waste**, as defined in 40 CFR 266, Appendix IX, Section 2.1.

Responses from each CEMS will be fed to the Control System (CS) where the CO hourly rolling average is calculated and interlocked to the waste feed cutoff valves as part of the Automatic Waste Feed Cutoff System (AWFCO) discussed in Section 2.8, below. The following provides a brief description of the CEMS instruments including the operating range and measurement principal.

2.6.1 CEM System Description

The Continuous Emissions Monitoring Systems (CEMS) currently being utilized at Incinerator 2 analyzes for opacity, carbon monoxide, hydrogen chloride, total hydrocarbons and oxygen. These monitors, except

opacity, are extractive devices mounted in sampling ports on the stack. The table below summarizes the analyzer specifications.

The opacity monitor continuously measures the stack gas opacity and reports the measurements to an indicator and a recorder. An opacity that exceeds a preset limit triggers an alarm and interlock.

Carbon monoxide and hydrogen chloride are monitored with extractive non-disperse infrared analyzers. Total hydrocarbon is monitored with an extractive flame ion detector analyzer. Oxygen is monitored with a zirconium oxide cell.

Stack gas flow rate is continuously monitored using an anubar that sends a 4-20 mA signal to the PLC which converts the signal to acfm.

Table 2-1 Unit 2 Continuous Emission Monitors

Parameter	Current Mfg.	Range	Principle
Oxygen	COSA	0-25%	Electrochemical
Carbon Monoxide	Ecochem MC3	0-200 ppmv 0-3000 ppmv	Infrared
Total hydrocarbons	Thermoelectron	0-100 ppmv	FID/Infrared
Hydrogen chloride	Ecochem MC3	0-1,000 ppmv	Infrared
Opacity	Teledyne	0-100%	White light
Stack gas flow	PSE/Rosemount	0-20,000 acfm	Pressure drop

2.7 Process Monitoring and Control

The facility is equipped with a state-of-the-art monitoring and control system, which facilitates compliance with permit conditions, and otherwise, collects process control information, facilitates efficient operation and detects and prevents damage to the facility. The system consists of three major components:

- A human–machine interface (HMI) system,
- Programmable logic controller's (PLC's), and
- A high speed ethernet cable connects all control system components

The desired control functions are implemented through the HMI system. All digital control and emergency interlocks are accomplished by the PLC.

The control system is capable of monitoring the "operational envelope" of the incinerator and is capable of performing a number of activities including:

- Control room indication of processor sensors located within the incinerator system (such as pressure indication of a field installed pressure transmitter);
- Process controller for single instrument loops or an individual sub-system, such as a temperature control loop involving a sensor reading from one temperature transmitter affecting the function of one temperature control valve; and
- Alarm for an exceedance of a designated setpoint, such as a high pressure or low temperature.

The process control computer will continuously control and monitor the operation of the incinerator. When out-of-range conditions exist, it will notify the operator of those conditions. The process control computer is programmed to shut-down equipment (i.e., bring the system into a safe mode) when designated parameters are exceeded, which is a protective mechanism against potential equipment damage, operation outside of permit limits, or conditions that might lead to a release to the environment.

Continuous monitoring of the incinerator and scrubber system is an important aspect of the system design. A digital readout of all monitoring instrumentation is displayed on the main control screen. An audible and visual alarm alerts the incinerator operator to significant deviations from normal operating conditions. This system allows an immediate response to adverse conditions by the operator. Automatic waste feed cut-off and incineration shutdown mechanisms are also interlocked with the monitoring system at or prior to reaching permit limit levels. Monitoring methods and calibration frequencies are listed in Table 2-3.

The Incinerator has an independent process control computer that interfaces to the Quantum programmable controllers. The process computer is capable of controlling the incinerator in case of a failure in a HMI server. This computer runs a RSVIEW HMI control software that provides operator interface to all instrumentation and controls.

2.8 Automatic Waste Feed Cut-off System [40 CFR §63.1207(f)(1)(iii)(F)]

The incinerator has an Automatic Waste Feed Cut-Off (AWFCO) System that will shut waste feeds off in the event certain operating parameters deviate from allowable set points. The PLC continuously monitors operating parameters, making adjustments to the process as needed for proper control. Alarm logic is incorporated into the PLC system to automatically initiate an AWFCO. Table 2-3 summarizes the current AWFCO set points. AWFCO limits have been established based on several factors that are summarized below.

- Regulatory/permit limits – established to comply with existing permits. An example of this type of limit is the low temperature limit, below which waste cannot be fed until the proper limit is re-established. In addition, the HWC MACT regulations require that the AWFCO system be interlocked with the span of each process instrument that is part of the Continuous Monitoring System (CMS). A listing of these CMS instruments and their interlocked span setpoints is maintained as part of Veolia's Operating Record.
- Process safety limits – established to assure process equipment is protected and unsafe operating conditions do not occur. An example of this is inadequate excess air in the combustion chamber that can lead to fuel rich conditions.
- Utility or Power failure – established to facilitate a controlled shutdown of the process during loss of process air, steam, water or electricity. An example of this is the loss of instrument air that is necessary for certain types of process instruments to function properly. Wastes will not be re-introduced into the incinerators until proper operation of key instruments is re-established.

In addition to the AWFCO system, operators can manually shutdown waste feeds or the entire process should this be needed.

2.8.1 AWFCO System Testing

Veolia tests the AWFCO systems bi-weekly. Instrument calibrations are performed as indicated in Table 2-3. In some cases this testing occurs more frequently depending on how often actual AWFCOs occur at the unit. Per the required frequency, incinerator personnel check the functionality of AWFCO logic that is part of the

incinerator's PLC system to make sure that should process conditions deviate from allowable limits, the computer logic will initiate waste feed shutdowns as required. This is accomplished by manually simulating process conditions that are outside allowable limits and observing and documenting when the control or block valve software logic on the waste feed line begins to initiate valve closure. Should actual AWFCOs occur during a given testing period, these are documented by operating personnel to satisfy regulatory requirements for system testing. Results of this testing are documented on a separate AWFCO Testing Log and maintained as part of the unit's Operating Record.

2.9 Air Pollution Control Equipment Maintenance Practices [40 CFR §63.1207(f)(1)(iii)(G)]

2.9.1 Program Overview

Once equipment is installed and operational, Veolia utilizes an extensive preventative maintenance (PM) program to keep equipment operational and prevent breakdowns and failures. Based upon the type of equipment and historical operations and maintenance experience, schedules for various inspection and PM activities are followed. This includes aspects such as documenting detailed maintenance histories on equipment, routine inspection and lubrication programs for high wear equipment and non-destructive testing of piping and vessels using techniques like ultrasound to assess integrity. The frequency of these activities varies depending upon the equipment, PM activity and the incinerator's shutdown schedule.

For example, frequent (i.e., weekly) instrument and certain mechanical equipment checks are made for critical process items. Lubrication, vibration analysis and other mechanical integrity checks are done at longer frequencies like monthly or quarterly. And finally, such items as inspecting refractory brick for wear, are typically performed when the entire incinerator is shut down for maintenance.

2.9.2 Test Program Preparation Activities

Prior to testing, instrumentation associated with key parameters of the test will be checked, calibrated, or replaced, as appropriate, to ensure proper operation of the instrumentation during testing (i.e., waste feed flowmeters and scales, CEM's, pressure transmitters, thermocouples, stack flowmeters, etc.).

Table 2-2 Technical Information Summary on Incinerator No. 2

Manufacturer	Trade Waste Incineration	
Model No.	TWI-2000, Series 2	
Type	Fixed Hearth, Dual Chamber	
Date of Manufacture	1987	
Dimensions	Primary Chamber	Secondary Chamber
External Length	17.5'	17.5'
External Diameter	9'	9'
Internal Diameter	7'2"	7'2"
Cross-sectional area	40.3 square feet	40.3 square feet
Burners	Primary Chamber Burner	Secondary Chamber Burner
Manufacturer	North American	North American
Size	12.0 Million Btu/hr	6.0 Million Btu/hr
Fuel	Natural Gas	Natural Gas
Primer Mover	Induced Draft Fan 15,000 acfm @ 400°F saturated, 22 in. water column	

Table 2-3 Current AWFCO Parameters and Limits for Incinerator No. 2

System	Device	Units	Cutoff Limits	Calibration Frequency
Total Pumpable Waste Feed rate	Mass Flowmeters/Scales	Lb/hr	> 3,123 (HRA)	Annually
Total Waste Feedrate	Mass Flowmeters/Scales	Lb/hr	>4,301	Annually/quarterly
High BTU Liquid feedrate	Mass flow meter	lb/hr	≥ 2,012	Annually
Low BTU Liquid feedrate	Mass flow meter	lb/hr	≥ 1,993	Annually
Specialty feeder	Scale	lb/hr	≥ 724	Quarterly
Total LVM Feedrate	Mass Flowmeters/Scales	lb/hr	> 1,264 (12 HRA)	Annually/quarterly
Pumpable LVM Feedrate	Mass flow meter/Scales	lb/hr	> 1,264 (12 HRA)	Annually/quarterly
SVM Feedrate	Mass Flowmeters/Scales	lb/hr	>3,477 (12 HRA)	Annually/quarterly
Mercury Feedrate	Mass Flowmeters/Scales	lb/hr	> 0.0073 (12HRA)	Annually/quarterly
Chlorine Feedrate	Mass Flowmeters/Scales	lb/hr	> 237 (12 HRA)	Annually/quarterly
Ash Feedrate	Mass Flowmeters/Scales	lb/hr	> 673 (12 HRA)	Annually/quarterly
Primary Combustion Chamber Temperature	Type K Thermocouple	°F	≤1,590 (one-minute average) <1,712 (HRA[1]) ≥2,400 (instantaneous)	Annually
Secondary Combustion Chamber Temperature	Type K Thermocouple	°F	≤1,794 (one-minute average) <1,845 (HRA[1]) ≥2,400 (instantaneous)	Annually
Primary Combustion Chamber pressure	Pressure transmitter	in. w.c.	≥ -0.1 (5 second delay)	Quarterly
Secondary Combustion Chamber pressure	Pressure transmitter	in. w.c.	≥ -0.1 (5 second delay)	Quarterly
Chlorine Feed to Slurry Flow Ratio	Flowmeter	ratio	> 33.5	Annually
Spray Dryer Adsorber Outlet Temperature	Type K Thermocouple	°F	≥500 (one minute average) >420 (HRA)	Annually
Combustion Gas Flow Rate	Pitot Tube	acfm	≥17,198 >15,534 (HRA)	Annually
Stack Gas Excess Oxygen	Zirconium Oxide fuel cell	%	< 3 (one-minute avg.)	Quarterly
Stack carbon monoxide	Infrared	ppmv	≥100 (HRA) ≥500 (one minute average)	Quarterly
Stack Hydrocarbon	FID	ppmv	≥10 (one minute average)	Quarterly
Stack gas opacity	White Light	%	≥10 (one minute average)	Quarterly

System	Device	Units	Cutoff Limits	Calibration Frequency
Stack hydrogen chloride	Infrared	ppmv	≥100 (HRA) ≥500 (one minute average)	Quarterly
Fabric filter pressure drop	Delta P transmitter	in. w.c.	≤ 2 or ≥ 10 (1 min. average)	Quarterly

[1] HRA means "hourly rolling average" as calculated by averaging the previous 60 one-minute average values.

3.0 Incinerator Feed Stream Descriptions

3.1 General

Veolia treats a broad range of wastes and thus the individual streams that may make up the incinerator overall feed at any given time can vary greatly, depending on generator production and shipping schedules. Prior to scheduling wastes for shipment to the facility, the waste streams are characterized by the generator and reviewed by Veolia staff. A Waste Profile Number uniquely identifies each different waste stream. This assures that only pre-approved wastes are handled at the facility and that all necessary regulatory, handling, safety and other important information is available to Operations personnel. Organic Hazardous Air Pollutants (HAPs) measured or expected (based on process knowledge) to be present in a source waste at or above approximately 0.1 % by weight are listed in the tables in this Section. Organic HAPS not listed are, based on process knowledge, believed to be either completely absent or present in the waste at less than 0.1 % by weight.

In addition to the information below that summarizes the top volume waste streams processed at Veolia, Table 3-1 provides a summary of the major HAPs processed at the facility.

3.2 High volume wastes

3.2.1 Liquid wastes

Liquid wastes are received at the Sauget facility in tank trucks and drums and are either direct fed through a dedicated line or are blended with other compatible waste streams into the tank farm. Table 3-1 provides a summary of the top volume liquid streams that have been processed in the last year. Liquid wastes can be processed in any one of the three incinerators. These streams can be organic, aqueous or a mixture.

3.2.2 Bulk solids

Table 3-2 provides a summary of the top bulk solid streams handled at the Sauget facility. Bulk solids can include streams like contaminated soils, wastewater sludges or manufacturing process solids. These wastes are received at the site primarily in 20 to 40 cubic yard roll-off containers or other similar bulk transport vehicles.

3.2.3 Containerized Waste

Table 3-3 provides a summary of the top containerized waste streams handled at Sauget. Containerized wastes are received in drums and smaller cartons, boxes or pails and can include materials such as laboratory waste, spent carbon, process residues.

3.2.4 Gaseous Wastes

Small volumes of compressed gases are processed in Unit 2 however these are minimal in comparison to the other waste types that are treated.

3.3 Auxiliary fuels

Natural gas or #2 fuel oil can be used as auxiliary fuels to start-up and obtain desired temperatures in the incinerators. At this time, all incinerators use natural gas as their primary fossil fuel. Typical composition of both fuels is provided in Tables 3-5 and 3-6.

Table 3-1 Top Volume Liquid Waste Streams

Profile	Waste Name	Annual Pounds Received
BZ3328	REFLUX WATER	3,222,363
388955	1.51B WASTE ORGANICS/MKH	2,897,025
397628	DE175-IPA WASH & FILTRATE WASH	2,192,832
346631	SEMICARBAZIDE PROCESS WASTE	1,594,454
388852	BULK MIXED WASTE LIQUIDS	1,453,766
393651	PVA PRODUCTION	1,273,063
410013	DP202	949,035
296227	RINSE WATER/AG CHEMICAL	815,882
351071	BULKED LIQUID HIGH BTU >3000	797,682
BF0568	BULK LIQUIDS LOW BTU <3000	753,595

Table 3-2 Top Bulk Solid Waste Streams

Profile	Waste Name	Annual Pounds Received
396871	DOG FOOD	9,682,704
346603	HYDROCARBON TANK BOTTOMS	3,677,040
562221	BULK SOLID WASTE BTU >5000	2,638,520
330548	HYDROCARBON WASTE FROM PETROLE	2,567,400
396775	WASTEWATER TRASH BOXES-DRY	1,613,940
351070	CWD BULKED INCINERATION SOLID	1,610,360
674065	DRUMS & BULK CONTAINING GREASE	1,557,680
350400	SMALL PAINT CANS	1,380,780
024042	SURGE TANK CLEAN OUT	1,058,000
360069	PRIMARY SEPARATOR SLUDGE	956,980

Table 3-3 Top Containerized Solid Waste Streams

Profile	Waste Name	Annual Pounds Received
SOL003	SOLIDS CHLORINE < 25%	1,635,929
395485	NON-HAZ PRODUCTION WASTE PPE	1,439,513
CG6944	PILOT PLANT SOLVENTS	1,026,877
BB1445	REP LAB PACK (DCN)	858,467
LOP003	LOOSE PACKS OF NON-REGULATED	855,396
393399	PHARMACEUTICALS (DEA)	771,078
393758	Q8-6061 SILOXANE DRUMS	648,240
360169	M865 ROUNDS	646,796
346662	FLAMMABLE LAB WASTE	579,685
640004	PHARMACEUTICAL SAMPLES	567,961
PZLOP4	LOOSE PACKS OF NON-REG USED	548,425
579751	SHARPS WITH CONSUMER PRODUCTS	547,098

Table 3-4 Summary of Major HAPs Processed

HAP	CAS Number	Annual Pounds Received
Toluene	108-88-3	1,692,440
Methanol	67-56-1	1,534,599
Acetonitrile	75-05-8	654,939
Xylene (mixed isomers)	1330-20-7	595,372
Methyl isobutyl ketone	108-10-1	515,310
n-Hexane	110-54-3	348,994
Acrylonitrile	107-13-1	329,248
Methyl ethyl ketone	78-93-3	201,431
Methyl tert-butyl ether	1634-04-4	188,219
Hydrazine	302-01-2	180,238

Table 3-5 Typical Properties for Supplemental Fuel Oil

Parameter	Units	Value	Parameter	Units	Value
Heat Value	Btu/lb	> 17,000	Chromium	ppm	2.0
Ash Content	% wt	< 5.0	Lead	ppm	< 20
Chloride Content	% wt	< 2.0	Mercury	ppm	N/A
Antimony	ppm	< 1.0	Nickel	ppm	< 10
Arsenic	ppm	< 1.0	Selenium	ppm	< 0.1
Barium	ppm	< 2.0	Silver	ppm	< 0.1
Beryllium	ppm	< 2.0	Thallium	ppm	< 0.05
Cadmium	ppm	< 5.0			

Table 3-6 Typical Properties for Natural Gas

Component	Units	Value	Component	Units	Value
Methane	mole %	94.428	Heptanes	mole %	0.019
Ethane	mole %	3.081	Octanes	mole %	0.005
Propane	mole %	0.582	Nitrogen	mole %	0.703
Isobutane	mole %	0.087	Carbon Dioxide	mole %	0.824
N-butane	mole %	0.129	Helium	mole %	0.014
Isopentane	mole %	0.040	Hydrogen	mole %	0.023
N-pentane	mole %	0.032	Argon	mole %	0.0
Hexanes	mole %	0.029	Oxygen	mole %	0.004
Parameter	**Units**	**Value**	**Parameter**	**Units**	**Value**
Heat Content, gross, dry	Btu/CF	1040.5	Relative Density	-	0.592
Heat Content, gross, sat.	Btu/CF	1023.6	Wobbe Index	-	1330

4.0 Performance Test Protocol

4.1 General Description

This Performance Test Plan has been designed to demonstrate performance under a single test condition using a combination of actual and spiked feeds. This test condition will be designed to establish maximum metals feed rates while demonstrating conformance with applicable HWC MACT metals emissions standards.

During the testing, Veolia will be seeking to establish new Operating Limits for Unit 2. Due to this, Veolia will adjust the limits at which the AWFCO system activates except for carbon monoxide. At the end of each day of testing, current AWFCO limits will be reinstated back to currently established limits.

4.2 Performance Standards

The test plan for the Veolia incinerator has been designed to demonstrate compliance with current performance standards of the Hazardous Waste MACT rule as follows:

- Conformance with the mercury emission limit of 130 µg/dscm corrected to 7% oxygen;
- Conformance with the semivolatile metal (cadmium and lead) emission limit of 230 µg/dscm corrected to 7% oxygen; and
- Conformance with the volatile metal (arsenic, beryllium and chromium) emission limit of 92 µg/dscm corrected to 7% oxygen.

4.3 Test Conditions [40 CFR § 63.1207(f)(1)(vi) and (vii)]

The test condition for this performance test is designed to demonstrate compliance with the applicable MACT metals emissions standards. Unit 2 will be operated at normal combustion zone temperatures during this condition with normal waste feed rates. The flue gas flow rate and chlorine feed rate will be maximized. The baghouse inlet temperature will be maximized. The proposed operating limits for the performance test are summarized in **Table 4-1.**

4.4 Waste Feed Spiking

In order to demonstrate the required performance criteria for this program, it will be necessary to fortify (spike) the incinerator feeds with organic and inorganic constituents. The spiking levels and approach proposed for this performance test have been used successfully in the past for testing at not only Veolia but for testing at other hazardous waste combustion facilities as well.

Each spiked material will be prepared to a known specification and verified by a certificate of analysis. These materials will be prepared and fed in a manner that assures a very consistent feedrate. Feed rates of each spiked compound are chosen to be well above expected levels in native wastes, generally an order of magnitude or more higher, so that the spiked constituent is the dominant feed and the native contribution is not significant. Spiking rates are also selected based on historical performance to assure that emissions can be detected and actual results, versus non-detect results, are used in calculation removal efficiencies.

4.4.1 Inorganic Constituents

Several metals will be spiked to the system to permit calculation of system removal efficiencies (SREs), which can then be used to determine appropriate feed rate limits, as necessary. Regulated metals may be fed at some level in the native waste materials to be used during the test. However, these native concentrations may not be high enough to achieve the desired feed rate limits to be set for the system. Therefore, Veolia plans to spike three surrogate metals at higher than normal rates to ensure that sufficient metals are fed to achieve measurable emissions in the stack emissions.

Table 4-2 provides an overall summary of information relevant to the metals testing portion of the program. SRE data from previous test programs have been used in conjunction with present feed rate limits and present MACT emission limits to specify target feed rates that will result in acceptable emission rates. This table is only used as a predictive tool, however, and final limits to be imposed will depend on the actual results of the performance test. Two other points are worth noting with regard to Table 4-2:

- The spiked amount for a given metal will be the difference between the desired feed rate limit and the native quantity expected to fed during the test; and
- Surrogate metals will represent the whole group (in the case of LVM and SVM) and test results will be used to extrapolate up to the applicable MACT standard.

The three metals to be spiked are representative of the three classes of metal volatility and therefore can be used to set limits for any metals not spiked.

4.4.2 Spiking for the LVM Category

The LVM Category for incinerators includes arsenic, beryllium and chromium. Veolia plans to spike chromium at 40-45 lb/hr to establish a SRE for all three test runs. The SRE demonstrated during the performance test for chromium will be used to establish a LVM feed rate limit.

Chromium will be spiked as chromic acid through a liquid feed injector via a pumping station that will monitor the feed rate. Waste chromic acid is treated at Veolia and thus, spiking chromic acid during the performance test is representative of normal operations.

4.4.3 Spiking for the SVM Category

The SVM category for incinerators includes cadmium and lead. Veolia plans to spike lead at 60-65 lb/hr during the performance test to establish a SRE for all three runs. The SRE demonstrated during the performance test for lead will be used to establish a SVM feed rate limit.

Lead will be spiked as lead nitrate and delivered in small, pre-measured plastic baggies at regular intervals along with other solid waste feeds during the performance test. Lead containing waste that are normally treated at Veolia are predominantly bulk or containerized solids and thus, this spiking approach during the performance test is representative of normal operations.

4.4.4 Spiking for Mercury

For mercury, the only high volatile metal, Veolia plans to spike this at approximately 0.001 – 0.002 lb/hr and will follow a similar approach as noted above for the other MACT-regulated metals. Mercury will be fed as a mercuric nitrate solution at regular intervals along with other solid feeds during the performance test. Mercury is predominantly present in solid feeds processed at Veolia and using a liquid solution for spiking will provide

an easily volatilized form fed along with other solid feeds in a manner that is representative of normal operations.

4.5 Metals Extrapolation Method

Veolia plans to extrapolate to higher feed rate limits than actually fed during the test using the performance test-established SREs. This is appropriate since it is generally agreed that SREs at higher feed rates would be at least as good as those observed at the lower level. Any extrapolation performed will take into consideration the MACT standards to ensure full compliance. Based on previous discussions with EPA Region 5, the following approach will be used.

The average SRE for the three runs would be calculated from the feed and emission rates for each run and an average SRE for the performance test. A feed rate limit would then be calculated for each metal category by dividing 75% of the emission standard for that category by the SRE for the spiked compound representing that category. A similar approach would be followed for SVM (cadmium and lead) and for mercury. To further assure that this method is protective, Veolia proposes to limit the maximum feedrate for any one category to 10 times the spiked feed rate during the testing. The test program will establish 12-hour feed rate limits for the MACT metals. Example calculations are show below:

Maximum emission rate for extrapolation

= (emission standard ($\mu g/m^3$ @ 7% O_2) * 0.75 * Q_{stack} (dscfm @ 7% O_2) * 0.0283 m^3/ft^3 * 60 min/hr)/(453.6 g/lb * 10^6 µg/g)

Maximum extrapolated feed rate

= Maximum emission rate / (1 – SRE from performance test)

4.6 Description, Preparation and Delivery of Feeds for the Performance Test [40 CFR § 63.1207 (f)(1)(vi) and (vii)]

To the extent possible (and with the exception of the spiked constituents noted above), only normal waste materials processed at the facility will be fed to the incinerator during the test program. Waste materials will be stockpiled to meet the objectives for the target test parameters. These wastes will be characterized in advance of the test and kept until needed. All waste materials will be delivered to the facility in accordance with routine operation and currently permitted procedures as described elsewhere in this document.

4.7 Conditioning Time Needed to Reach Steady State [40 CFR § 63.1207(f)(1)(xii)]

The incinerator will be operated for 15 minutes at the desired feed rates and operating conditions before sampling begins for a given condition of the testing. This will assure all operating parameters are stabilized at the desired settings to achieve steady state before sampling.

4.8 Anticipated Test Schedule

The performance test will be performed over a 4-day period using a three-person field crew according to the schedule shown in **Table 4-3**. For this test program, it is anticipated that all runs will be approximately two hours in duration, as dictated by the sample run time required for metals measurements. The test program for this incinerator is planned to start on or after August 1, 2008.

4.9 Performance Test Reporting

The final report will be prepared for submittal no later than 90 days from completion of the field test program. This document will provide a concise presentation of performance test results and will include all necessary supporting documentation. An example outline of the final test report is presented below:

Section 1.0 Certification – Includes project title, statement of compliance and project approval signatures

Section 2.0 Summary of Test Results – Summary of emission results compared to applicable standards; interim status operating limits; overview of process operating conditions;

Section 3.0 Project Overview – Facility and unit description; project background and scope; test requirements; test chronology and report organization

Section 4.0 MACT Notification of Compliance – Regulatory requirements; performance test results and compliance determination; area or major source determination; description of air pollution control system; and description of process monitoring systems

Section 5.0 Process Operating Conditions – Overview of test conditions and summary of facility process monitoring data

Section 6.0 Sampling and Analytical Program Overview – Summary of proposed plans and discussion of actual activities and any required deviations from plan

Section 7.0 Test Results – Detailed presentation of waste analysis and stack sampling results including tabulated presentation of all data

Section 8.0 Quality Assurance / Quality Control – Detailed discussion of waste and stack sampling and analytical QA/QC procedures and results

APPENDICES
A – Facility Process Monitoring Data
B – Spiking Report
C – Field Sampling Documentation
D – Analytical Data Reports

Table 4-1 MACT OPLs to be Established During the Performance Test

Process Parameter	Units	Avg. Period	How Limit Established	Expected Limit
Maximum Flue Gas Flowrate	acfm	1-hr	Average of maximum HRAs for each run	14,500 – 17,000
Maximum Low Volatile Metals (LVM) Feed Rate	lb/hr	12-hr	Average of the average HRAs for each run	400 – 450
Maximum Total Pumpable LVM Feed Rate	lb/hr	12-hr	Average of the average HRAs for each run	400 – 450
Maximum Semi-Volatile Metals (SVM) Feed Rate	lb/hr	12-hr	Average of the average HRAs for each run	600 – 650
Maximum Total Mercury Feed Rate	lb/hr.	12-hr	Average of the test run averages	0.01 – 0.02
Maximum Chlorine/Chloride Feed Rate	lb/hr	12-hr	Average of the test run averages	200 – 250
Maximum Fabric Filter Inlet Temperature	°F	1-hr	Average of the test run averages	390 - 425

Table 4-2 Metals Evaluation Plan

Metal	Historical Feed Range (lb/hr)	Desired Feed Rate Limit (lb/hr)	Expected Spiked Quantity (lb/hr)	Expected Metal SRE (%)	Projected Emission Rate at the Desired Feed Rate Limit	
					(lb/hr)	µg/m³ @ 7% O_2
Mercury	0.07	0.01 – 0.02	0.001 – 0.002	85%	0.002	110
SVM	156	600 – 650	60 – 65	99.9999%	0.002	46
LVM	206	400 – 450	40 – 45	99.9999%	0.0005	32

Assumptions:

Qs = stack gas flow rate =	**5,838**	dscfm
O_2 = stack oxygen level =	**12.0**	% vol.

MACT Standards:

SVM (Cd and Pb) =	**230**	µg/m³
LVM (As, Be and Cr) =	**92**	µg/m³
Mercury =	**130**	µg/m³

* Surrogate metals to be spiked during the performance test

Table 4-3 Anticipated Performance Test Schedule

General Overview of Planned Schedule

Activity	Schedule
Mobilization, site safety training and set-up	Day 1
Preliminary traverses, Conduct Run 1 and Run 2	Day 2
Conduct Run 3	Day 3
Equipment removal and depart site	Day 4

Example of Detailed Daily Schedule (Day 2 Above)

Test Activity	Time
Incinerator lined out on trial burn wastes	07:00
Begin metal spiking	08:30
Initiate all stack sampling and waste sampling	08:45
Approx. end time for sampling runs	15:00
Recovery of sampling train	15:00 – 16:30
Depart Site	17:00

5.0 Sampling and Analytical Program Quality Assurance/Quality Control

This section presents the Quality Assurance and Quality Control goals, objectives, and procedures for the MACT performance test program. The quality assurance/quality control procedures and criteria for this program will comply with the requirements of this document and its updates. The analytical work conducted will incorporate the QA/QC requirements of the approved methods. This document has been prepared using available guidance provided in the following EPA documents:

- "EPA Requirements for Quality Assurance Project Plans", EPA QA/R-5, November 1999.
- "Component 2 - How to Review a Quality Assurance Project Plan (including Attachment A - Generic Trial Burn QAPP", Hazardous Waste Combustion Unit Permitting Manual, U.S. EPA Region 6, January 1998.
- "Handbook – Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration" (EPA/625/6-89/023 January 1990).

Quality Assurance Project Plan for Veolia's MACT Metals Performance Test for the Unit 2 Incinerator

Facility ID Number: ILD098642424

Prepared for: Veolia ES Technical Solutions, LLC, 7 Mobile Avenue, Sauget, IL 62201

Prepared by: ENSR Corporation, Westford, MA 01886

Revision No.: 0

Date: May 2008

5.1 Title Page

5.1.1 Project Title

Quality Assurance Project Plan for Veolia ES Technical Solutions HWC MACT Metals Performance Test Plan for the Unit 2 Fixed Hearth Incinerator.

5.1.2 Expected Performance Test Date

On or after August 1, 2008.

5.1.3 Project Approvals

Veolia Project Manager	Date
ENSR Project Manager	Date
ENSR QA Officer	Date
Maxxam Analytics Lab Services Coordinator	Date

5.2 Table of Contents

A complete table of contents, including listings of tables and figures and acronyms is presented at the beginning of this Performance Test Plan and includes all pertinent information applicable to this QAPP section.

5.3 Project Description

This project will consist of a comprehensive sampling and analysis program designed to demonstrate compliance with the HWC MACT rule requirements. Testing will be performed under one process operating condition, entailing triplicate sampling runs. Operating parameter limits (OPLs) associated with metals emissions testing will be re-established or modified based on the results of the program. The reader is referred to Sections 1.3, 1.4, 2.5.3 and 4.0 for further details on program scope, test objectives and target parameters for emission measurements and process monitoring. The remainder of this section outlines the detailed measures that will be followed to ensure collection of valid data. A brief overview of the measurements to be made during the test program is provided in **Table 5-1**. A more detailed summary of the sampling and analytical program is provided later in Section 5.6.

5.4 Project Organization

The ENSR Project Manager, Mr. Jeffrey Gorman will be responsible for the overall direction of this program and will report to the Veolia Project Manager, Mr. David Klarich. Mr. Gorman will be responsible for project design and implementation, communicating with the client, scheduling all activities, reviewing all project data and preparing all reports. He will be assisted in the oversight of Quality Assurance activities by the program Quality Assurance Officer (QAO) and each Analytical Laboratory Services Coordinator (LSC). Each contract laboratory will have one individual designated as the person responsible for project activities.

5.4.1 QA Officer's Responsibilities

Mr. Craig Doolittle will serve as the project Quality Assurance Officer (QAO) and will be responsible for review and approval of the Quality Assurance Project Plan presented in this section, as well as any subsequent revisions. He will monitor implementation of field and laboratory activities, scheduling performance and/or system audits as warranted. The QAO will report to the Project Manager on any conditions noted which may adversely affect data quality.

Mr. Doolittle will provide independent oversight for data verification and data quality assessment activities. He will prepare a section for the Final Report summarizing QA/QC activities and provide an overall evaluation of data quality.

5.4.2 Laboratory Coordinator Responsibilities

Each analytical laboratory will designate a Laboratory Services Coordinator (LSC), who will be the principal point of contact for the ENSR Project Manager. The LSC will review QA requirements with all laboratory staff to ensure that all required measures are taken to meet data quality objectives. They will monitor the shipment and receipt of samples, track analytical progress and review data as reported from the laboratories for completeness. Each LSC will be responsible for validation of all data generated by the laboratory for this program and will provide all necessary documentation for inclusion in the final report.

5.5 QA/QC Program Objectives

5.5.1 Precision, Accuracy and Completeness

The collection of data to fully characterize the incinerator waste feed materials and stack gas emissions requires that sampling and analysis procedures be conducted with properly operated and calibrated equipment by trained personnel. QA objectives for measurements made in the field are summarized in **Table 5-2**. QA objectives specific to each analytical methodology performed by the subcontractor laboratories are presented later in Section 5.9. The overall program has been designed with consideration of sampling parameters and analytical limits to ensure that the achieved MDLs for emissions will be more than adequate for regulatory limit decisions. Critical MDL determinations are addressed subsequently in Section 5.5.3.

Precision is defined as a measurement of mutual agreement among individual measurements made under prescribed similar conditions. Precision is expressed in terms of relative percent difference (RPD) between duplicate determinations and in terms of relative standard deviation (RSD) when 3 or more determinations are made. Overall precision for analysis of the waste feed streams will be assessed through the analysis of one set of duplicate samples for each designated parameter.

Accuracy is the degree of agreement of a measurement with an accepted reference or true value. Analytical accuracy will be measured through the recoveries of matrix spikes, analysis of standard reference materials or audit sample analysis. Matrix spike samples for the waste feed will be prepared by spiking known amounts of target analytes into a portion of the sample recoveries are monitored to assess laboratory and method accuracy. Laboratory control samples (LCS) will also be used to distinguish between method performance and matrix effects on accuracy. LCS and MS spiking solutions will be independent from calibration standards.

Completeness is a measure of the amount of valid data obtained compared to the amount that was expected under normal conditions. The overall program objective is to obtain valid data for three (3) runs for each test condition. For all data considered critical to the investigation, a completeness objective of 100% has been established. As a result, critical priority data from each of three (3) runs should achieve the precision and accuracy goals established herein. This completeness criterion applies to all permit parameters in emissions samples as well as feed/process stream samples. Individual samples for which the critical data points do not achieve accuracy and/or precision data quality objectives may require reanalysis. Results for samples where matrix interferences preclude meeting objectives for the recoveries of surrogates or spikes will be evaluated for potential bias to calculated emission results. In summary, the completeness goals are stated at 100%, since three valid runs are necessary to assess operation at any one condition.

5.5.2 Representativeness and Comparability

It is recognized that the usefulness of the data is also contingent upon meeting the criteria for representativeness and comparability. Wherever possible, reference methods and standard sampling procedures will be used. The QA objective is that all measurements be representative of the matrix and operation being evaluated. The detailed requirements for sampling given in the various EPA Reference Methods will be followed to ensure representative sampling of flue gases. The sampling of incinerator feed streams prior to the performance test will provide representative samples of these matrices.

The corresponding QA objective is that all data resulting from sampling and analysis be comparable with other representative measurements made by the performance test field team, on this or a similar process operating under similar conditions. The use of published sampling and analytical methods and standard reporting units will aid in ensuring the comparability of the data.

5.5.3 Method Detection Limit (MDL) Determinations

Method Detection Limits (MDLs) for the various analytes to be measured in this program will be determined following well-established laboratory procedures in accordance with standard EPA protocols. These are described below for those parameters deemed most crucial to the program.

5.5.3.1 Metals – Methods 6020 and 7470A

Reporting limits for all metals are determined based on the results of the latest MDL studies performed for each metal. For this program, the MDL for non-detect values will be determined by low-level replicate spiking of aliquots of the samples submitted. The reporting limit for non-detectable metals is a chosen whole number above the MDL, usually in the range of 1.5-2 times the MDL value.

5.6 Sampling and Monitoring Procedures

This section describes the procedures that will be followed during the field sampling program. Throughout the overall program, all sampling will be performed using sampling protocols described herein and approved by EPA. Regulatory agency approval will be obtained for any deviations from or changes to the approved Performance Test Plan which may be warranted prior to program implementation as a result of changes in personnel or facility circumstances. If situations occur during the demonstration testing which necessitate deviations from the plan, the agency will be notified and onsite approval requested. Any deviations from the specified protocols will be fully documented in the final Performance Test Report.

5.6.1 Field Program Description

A detailed description of the compliance strategy and test conditions was provided previously in Section 4.0. In general, however, the program is presently configured to collect samples during three runs for a single process operating condition. **Table 5-3** provides a detailed listing of the sampling and analytical parameters and methods planned for this program. All sampling will be conducted concurrently at the outlet stack location.

5.6.2 Pre-Sampling Activities

Pre-sampling activities include equipment calibration, sample media preparation, cleaning of sample train glassware, preparation of computer-generated sample labels, and other miscellaneous tasks. Each of these activities are described or referenced in the following subsections. Other pre-sampling activities include such details as team meetings, equipment packing and shipment, equipment setup, and finalization of all details leading up to the coordinated initiation of the sampling program.

5.6.2.1 Equipment Calibration

A most important aspect of pre-sampling preparations is the inspection and calibration of all equipment planned to be used for the field effort. Equipment is inspected for proper operation and durability prior to calibration. Calibration of equipment is conducted in accordance with the procedures outlined in the EPA document entitled "Quality Assurance Handbook for Air Pollution Measurement Systems; Volume III—Stationary Source Specific Methods" (EPA-600/4-77-027b). Equipment calibration is performed in accordance with EPA guidelines and/or manufacturer's recommendations. Documentation of all calibration records will be kept in the project file during the field program and will be available for inspection by test observers. Examples of field equipment used and typical calibration requirements follows:

- **Probe nozzles** (QA Handbook Section 3.4.2, pg. 19) - make three measurements of the nozzle ID (to the nearest 0.001 in.) using different diameters with a micrometer. Difference between the high and low values should not exceed 0.004 in. Post-test check - inspect for damage.
- **Pitot tubes** (QA Handbook Section 3.1.2, pp. 1-13) - measured for appropriate spacing and dimensions or calibrate in a wind tunnel. Rejection criteria given on the calibration sheet. Post-test check - inspect for damage.
- **Thermocouples** (QA Handbook Section 3.4.2, pp. 15-18) - verify against a mercury-in-glass thermometer at two or more points including the anticipated measurement range. Acceptance limits - impinger ±2°F; DGM ±5.4°F; stack ±1.5 percent of stack temperature.
- **Dry gas meters** (QA Handbook Section 3.4.2, pp. 1-12) - calibrate against a wet test meter. Acceptance criteria - pretest Yi = Y ± 0.02; post test Y = ± 0.05 Yi.
- **Field barometer** (QA Handbook Section 3.4.2, pp. 18-19) - compare against a mercury-in-glass barometer or use Airport Station BP and correct for elevation. Acceptance criteria - ± 0.02 in. Hg; post-test check - same.

5.6.2.2 Glassware Preparation

Sample train glassware and sample containers require specialized pre-cleaning to avoid contamination of the sample from the collection container or devices. Cleaning/storage procedures for sample train glassware are summarized below. Note that all bottle caps are fitted with teflon liners which are cleaned in the same manner as the bottles themselves. Sample containers used for waste feed streams are purchased pre-cleaned and sealed to specified EPA protocols.

- **EPA Method 29 glassware and containers (metals)** – wash with soap and water, rinse with hot tap water, rinse three times with reagent water. The glassware is next soaked in a 10% nitric acid solution for a minimum of 4-hours, rinsed three times with reagent water, rinsed a final time with acetone and air dried. All glassware openings where contamination can occur will be covered until the sampling train is assembled prior to sampling.

5.6.2.3 Sample Media Preparation

All reagents will be checked in accordance with ENSR's existing QC Program to minimize the probability of using contaminated solvents. This includes the use of the proper grade reagents/solvents as specified in the test method, selection of reagents from the same lot and the collection and analysis of the appropriate blanks. Sampling media will be procured and prepared in accordance with the appropriate test methods as described below:

- **Quartz filters** used in the Method 29 sampling train are purchased from Pallflex Products Co. who pre-screen filters for metals content.

5.6.2.4 Other Pre-Sampling Activities

Sample team meetings will be held to designate responsibilities to each team member. Assignments will be based on individual experience and relative importance of the assigned task. Other pre-sampling activities in the office will include generation of sample checklists, printing of computer-generated sample labels, and proper packing of all equipment. Equipment will then be transported by freight or truck to the sampling location.

Site setup is the final pre-sampling activity. This task will involve moving the equipment to the vicinity of the sample collection area. A separate office trailer or other suitable onsite facility will be used to serve as a sample train setup and recovery area and sample custody area.

Normally, preliminary tests are conducted at the stack location to verify the presence or absence of cyclonic flow conditions and to determine flue gas moisture, temperature and velocity. These measurements facilitate determination of nozzle size selection and sample train operation rates for the isokinetic sampling trains.

5.6.3 Sampling Locations

5.6.3.1 Waste Feed Streams

Waste feed materials will be sampled in accordance with the facility's feed stream analysis plan (FSAP) and RCRA Waste Analysis Plan (WAP). Waste feed sampling will occur upstream of any metal spiking location. Samples will be collected using methodologies described in the FSAP and WAP.

5.6.3.2 Stack Sampling Location

Sample test ports in the circular 39-inch inside diameter (ID) stack are located 32 feet (9.85 diameters) downstream of the induced-draft fan and 49 feet (15.1 diameters) upstream of the stack exit to atmosphere. In accordance with EPA Method 1, a 12-point traverse will be performed during testing. One test port level will be used to accommodate simultaneous testing of all emissions test parameters. **Figure 5-1** provides a schematic of the stack showing the location of the sampling ports. Actual traverse point locations and upstream/downstream distances from flow disturbances are shown in **Table 5-4**.

5.6.4 Waste Feed Stream Sampling Procedures

Each waste feed material fed during the test will be sampled from taps in the feed lines or other appropriate locations, upstream of any metal spiking location. During the testing each waste feed material will be sampled at the start of each run, at port change, and at the completion of each run. After testing is completed, the three samples that were collected will be composited and analyses will be performed on this composite sample. The feed streams will be characterized for ash, heat content, metals (arsenic, beryllium, chromium, cadmium, lead, and mercury) and total chlorine. Veolia will be responsible for all waste feed analyses.

5.6.5 Stack Sampling Methodologies

Gases discharged from the exhaust stack will be sampled by ENSR for the following parameters:

- Flue gas velocity, flow rate, temperature, moisture content and fixed gas (O_2 and CO_2) composition;
- MACT Metals – arsenic, beryllium, cadmium, chromium, lead and mercury;

The following sections provide summaries of the sampling methodologies to be followed. In addition, sample field data sheets to be used during the program are provided in **Appendix B**. Summaries of relevant information pertaining to setup and recovery of the EPA Method 29 sampling train are provided in **Appendix C**.

5.6.5.1 Gas Stream Velocity, Moisture and Fixed Gases

Gas stream flowrate, moisture and fixed gas concentration will be determined concurrent with the EPA Method 29 isokinetic sampling train. Gas stream velocity will be determined using a pitot tube and water manometer in accordance with EPA Method 2. Gas stream temperature will also be determined at each of the Method 2 traverse points using a Type "K" thermocouple and pyrometer. Gas stream moisture will be will be determined as specified in EPA Method 4 concurrent with the EPA Method 29 isokinetic sampling train. In this procedure the impinger contents are measured or weighed before and after each test run and used in conjunction with the metered gas volume to determine the gas stream moisture content. Fixed gases (O_2 and CO_2) for gas stream molecular weight determination and constituent oxygen correction will be determined in accordance with EPA Method 3 (Orsat procedure) during each test run.

5.6.5.2 Metals

EPA Method 29 will be utilized for the collection of MACT and other metals including:

- MACT LVM metals – arsenic, beryllium and chromium;
- MACT SVM metals – cadmium and lead; and
- Mercury.

Specific sampling details for the Method 29 sampling train are as follows:

- Target sampling rate - 0.75 cfm
- Sample run time - 2-hr
- Number of sampling points per stack traverse - 6
- Total number of sampling points - 12
- Number of field reagent blank sets collected – 1

5.6.5.3 Continuous Emission Monitoring

ENSR will provide measurement of oxygen (O_2) and carbon dioxide (CO_2) throughout all test run periods. These parameters will be measured using the procedures specified in 40 CFR 60, Appendix A, Method 3 (Orsat analysis).

Veolia will provide continuous emission monitoring for carbon monoxide (CO) during all three test runs in accordance with the facility's Quality Assurance Plan for their CEMs.

5.7 Sample Handling, Traceability and Holding Times

Sample integrity will be maintained throughout all phases of the sampling and analysis program. Samples will be held within sight of the samplers or sample custodian, or will be kept in sealed or secured containers at all times. Sealed coolers and DOT shipping boxes will be used to ship samples to the designated laboratory via Priority 1 overnight FedEx service.

Preprinted sample identification labels are used by ENSR to ensure that all required information is fully documented. When sample batches are shipped to the specified laboratory, a sample packing list (see

Figure 5-2) accompanies the shipment. This form is based on established laboratory format and will be used to document sample transfer in the field and from sampling personnel to the laboratory.

The ENSR Field Team Leader will coordinate the packing and shipment of all samples. Worksheets specifically designed for this program will be generated prior to the field effort. These sheets will assist the Field Team Leader in assuring that all samples have been collected, accounted for and shipped under sample traceability documentation to the appropriate laboratory. Requirements pertaining to sample preservation and recommended holding times are noted in **Table 5-5**. All materials such as field and laboratory notebooks and logbooks, field and laboratory data records, correspondence, reports, sample tags, traceability records and instrument printouts will be clearly labeled with the project number and become a permanent part of the project file. Project samples will be disposed of in an appropriate manner 60 days after acceptance and approval of a final report. All project-related documentation at the subcontractor laboratory will be kept on file for 2 years following submittal of the final report.

5.8 Analytical Methods and Calibration Procedures

This section delineates the analytical protocols that will be used to analyze samples during this performance test. Samples of waste feed materials and stack gas will be collected and analyzed for the parameters previously discussed using the appropriate laboratory protocols detailed in this section and as outlined previously in Table 5-3.

5.8.1 Analysis of Waste Feed Streams

5.8.1.1 Chemical and Physical Properties of Waste Feed Streams

Analyses to determine the chemical and physical properties of the waste feed materials will be performed using appropriate ASTM or EPA SW-846 analytical methods as outlined in the Veolia FSAP and WAP. For any analytical results that are "non-detect", Veolia will utilize ½ of the detection limit for that parameter in any calculation of feed rates.

5.8.2 Analysis of Stack Gas Samples

5.8.2.1 Metals in Stack Gas Samples

Analysis - Each sampling train will be prepared and analyzed in accordance with EPA Reference Method 29.

From each sampling train, seven individual samples are generated for analysis. The first two samples, labeled Fractions 1A and 1B consists of the digested sample from the front half of the train, consisting of the particulate filter and the front-half nitric acid probe rinse. Fraction 1A is for ICP analysis and Fraction 1B is for mercury analysis. Fractions 2A and 2B consist of digestates from the moisture knock out and HNO_3/H_2O_2 impingers 1, 2, and 3. Fraction 2A is for ICP analysis and Fraction 2B is for mercury analysis. Fractions 3A, 3B and 3C consist of the impinger contents and rinses from the empty and permanganate impingers 4, 5, and 6. These fractions will be analyzed for mercury.

Analyses for metals other than mercury will be performed using Inductively Coupled Plasma Mass Spectroscopy (ICP-MS) as described in EPA Method 6020 (SW-846, 3rd Edition). Mercury analysis will be performed using EPA Methods 7470A or 7471A (SW-846, 3rd Edition).

All quality control procedures, including the interference check standard, will be followed as described in the respective method.

Calibration - Calibration of the ICAP will be performed daily in accordance with the procedures described in Method 6020 and the manufacturer's instructions. The calibration is verified daily by analysis of an instrument check standard prepared from an EPA quality control concentrate or other independent standard.

QA/QC requirements for the analysis of metals in stack gas samples are summarized in **Table 5-6**.

5.9 Internal QA Program

Quality control checks will be performed to ensure the collection of representative samples and the generation of valid analytical results for these samples. These checks will be performed by project participants throughout the program under the direction of the Project Manager and the QA Officer.

5.9.1 Data Collection and Sampling QC Procedures

QC checks for the process data collection and sampling aspects of this program will include, but not be limited to, the following:

1. Use of standardized data sheets, checklists and field notebooks to ensure completeness, traceability, and comparability of the process information and samples collected.
2. Field checking of standardized forms by the Field Team Leader and a second person to ensure accuracy and completeness.
3. Strict adherence to the sample traceability procedures.
4. Submission of field biased blanks.
5. Leak checks of sample trains before and after sample collection and during the test, when appropriate.

5.9.1.1 Sampling Equipment QC Checks and Frequency

Calibration of the field sampling equipment will be performed prior to and at the conclusion of the field sampling effort. Copies of the calibration sheets will be available onsite during the field sampling program for inspection, will be kept in the project file and will be submitted in the final report. Calibrations will be performed as described in the EPA publication "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods;" Section 4.2.1 presents acceptance limits.

Leak checks of the sample trains will be conducted in accordance with the protocol called out for each method. Leak checks will be conducted prior to and at the end of sample collection and during the test run, when appropriate.

5.9.1.2 Sample Collection QC Checks

Field-biased blanks of reagents and collection media (deionized water, filters, impinger solutions, etc.) will be placed in appropriately cleaned and sized sample containers in the field and handled in the same way as actual field samples, to provide a QC check on sample handling.

For this program, sample collection QC checks and frequency for samples to be analyzed in the laboratory are listed below:

- One field reagent blank Method 29 sampling train.

5.9.2 Analytical QC Procedures for Samples to be Analyzed in the Laboratory

The Quality Control program for laboratory analysis makes use of a number of different types of QC samples to document the validity of the generated data. The following types of QC samples will be used during the program.

5.9.2.1 Quality Control Samples and Blanks

Method Blanks

Method blanks contain all the reagents used in the preparation and analysis of samples and are processed through the entire analytical scheme to assess spurious contamination arising from reagents, glassware, and other materials used in the analysis.

Calibration Check Samples

One of the working calibration standards which is periodically used to check that the original calibration is still valid.

Laboratory Control Samples (LCS) or Blank Spikes

These samples are generated from spikes prepared independently from the calibration concentrates. The LCS are used to establish that an instrument or procedure is in control. An LCS is normally carried through the entire sample preparation and analysis procedure also.

Reagents used in the laboratory are normally of analytical reagent grade or higher purity; each lot of acid or solvent used is checked for acceptability prior to laboratory use. All reagents are labeled with the date received and date opened. The quality of the laboratory deionized water is routinely checked. All glassware used in the sampling and analysis procedures will be pre-cleaned according to the method requirements. Standard laboratory practices for laboratory cleanliness, personnel training and other general procedures are used. The results of these quality control procedures will be included in the final report.

5.10 Data Reduction, Verification and Data Reporting

Specific QC measures will be used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in all such projects.

5.10.1 Field Data Reduction

Appendix B of this Performance Test Plan presents the standardized forms that will be used to record field sampling data. The Field Team Leader and at least one other field crewmember will review the data collected from each train in its entirety in the field. Errors or discrepancies will be noted and dealt with accordingly. The Field Team Leader has the authority to institute correction actions in the field. The QA officer will also be notified for resolution if the situation warrants. At a minimum, the QA officer is apprised of all deviations from standard protocol. Field data reduction (checking of valid isokinetic sampling rate and other sampling parameters) is done with a laptop computer using standardized Excel spreadsheets. **Appendix C** provides sample train setup and recovery schematics and a description of solutions and reagents to be used in each isokinetic train required for the overall program. All sample recovery sheets will be checked for completeness.

5.10.2 Laboratory Analysis Data Reduction

Analytical results will be reduced to appropriate units by the laboratory using the equations given in the applicable analytical method. Unless otherwise specified, results from the analysis of waste feed and process samples for specific target constituents will be reported in units of mg/kg or % wt. Other parameters will be reported in standard units such as g/cc, Btu/lb, etc.

The laboratory typically reports results from the analysis of stack flue gas samples as total mass detected for the sample submitted. For those sample fractions where liquid impinger condensate is analyzed, the laboratory will measure the total liquid volume submitted and multiply by the measured concentrations of target analytes in these samples. The laboratories will generally report data as follows:

- All metals except mercury – total **µg** of each metal in the combined front-half and back-half sample train fractions
- Mercury –total **µg** in each sample train fraction

Each LSC will be responsible for reviewing all results and calculations and verifying the completeness of the data set. The laboratory reports submitted by each laboratory will include the following deliverables:

- Transmittal letter listing all samples and analyses and a case narrative identifying any difficulties associated with the analyses and any anomalous QA/QC results
- Copies of Chain of Custody Forms
- Sample Report forms with sample field and laboratory identifier, dates of sample preparation and analysis, analytical results and detection limits
- Method Blank results
- Matrix spike and matrix spike duplicate results (as applicable)
- Replicate sample analyses (as applicable)
- Laboratory Control Sample results

5.10.3 Data Verification

Data verification is the process of reviewing data and accepting, qualifying or rejecting it on the basis of method-specific criteria. The independent project QAO will use validation methods and criteria appropriate to the type of data and the purpose of the measurement. Records of all data will be maintained, even that judged to be an "outlying" or spurious value.

Field sampling data will be validated by the Field Team Leader based on a judgment of the representativeness of the sample, maintenance and cleanliness of sampling equipment and the adherence to an approved, written sample collection procedure.

Analytical data will be validated by the subcontractor laboratory QC or supervisory personnel using criteria outlined in their laboratory-specific QA Plan and/or written SOPs. Results from field and laboratory method blanks, replicate samples and internal QC samples will be used to further validate analytical results. Analytical results on field blanks and replicate field samples are valuable for validation of sample collection also. QC personnel will review all subcontractor laboratory raw analytical data to verify calculated results presented.

The following criteria will be used to evaluate the field sampling data:

- Use of approved test procedures
- Proper operation of the process being tested
- Use of properly operating and calibrated equipment
- Leak checks conducted before and after tests
- Use of reagents that have conformed to QC specified criteria
- Use of NBS traceable CEM calibration gases (as applicable)
- Proper chain-of-custody maintained
- All sample trains --check to ensure proper sample gas volume collected

The criteria listed below will be used to evaluate the analytical data:

- Use of approved analytical procedures
- Use of properly operating and calibrated instrumentation
- Precision and accuracy achieved should be comparable to that achieved in previous analytical programs and consistent with objectives stated in this document.

5.10.4 Final Data Reporting

Stack gas concentrations for each applicable parameter will be calculated from laboratory results and field sampling data. The total weight of the analyte detected will be divided by the volume of gas sampled to provide emission concentrations. For MACT compliance, all emission concentrations are further corrected to 7% oxygen for comparison to the published standards.

A complete Final Report outlining the goals, methods and results for the program will be prepared and any deviations from this test plan will be documented. The Final Report will include a section on evaluation and discussion of QA/QC results. Results will be compared to expected limits for accuracy, precision and/or completeness as targeted in this protocol. The final test report will also include the results of any internal audits conducted on the program as well as:

- All field data sheets showing sampling method, dates, run times, personnel, equipment; sample preservation, identification and compositing records.
- Field equipment calibration data.
- Analytical lab reports and relevant supporting documentation.

5.11 Routine Maintenance Procedures and Schedules

This section provides pertinent information for field sampling equipment as well as a listing of all critical facility equipment necessary to maintain permitted operating conditions and to demonstrate continuing permit compliance. Information is provided for preventive maintenance and schedules and spare parts for key equipment and instrumentation.

5.11.1 Field Sampling Equipment

The field team follows an orderly program of positive actions to prevent the failure of equipment or instruments during use. This preventive maintenance and careful calibration helps to ensure accurate measurements and minimal field delays.

All equipment that is scheduled for field use is calibrated as outlined previously in Section 5.6.2.1. Prior to each field use for a specific project, the equipment is cleaned and checked to ensure it is in good working order. An adequate supply of spare parts and sample train glassware is brought to each site to minimize downtime and field sampling delays. Any equipment that does experience problems is appropriately tagged in the field to ensure that it is repaired upon return to the office.

5.11.2 Facility Equipment and Instrumentation

As stated in Sections V.a.F. and V.b.F. of Veolia's Part B RCRA Permit, each incinerator system undergoes a "thorough visual inspection for leaks, spills, fugitive emissions, and sign of tampering at least daily and in accordance with the inspection schedule contained in Appendix 6 of the approved permit application". Veolia utilizes these inspections and additional preventive maintenance activities as proactive measures for minimizing the potential for malfunctions. To facilitate proper maintenance, a cold shutdown will occur at least once per year for each incinerator system.

Routine inspection and maintenance activities are scheduled, communicated, and recorded through the use of field checklists. Parts of the incinerator systems that are subject to wear (e.g., bearings, O-rings, air/oil filters) are replaced based on the schedules indicated on these checklists. These field checklists will also be used to document repairs or replacements of incinerator components that may be revealed during inspections. Brief procedures/instructions for inspection and maintenance activities are provided on field checklists.

Continuous monitoring system components are comprised of many instruments including scales, flowmeters, thermocouples, pressure transmitters, differential pressure cells, bag leak detectors, and limit switches. All components critical for monitoring permitted parameters are audited either on a quarterly or annual basis to ensure proper operation. Daily calibration checks are performed on the Unit's CEM's.

5.12 QA/QC Assessment Procedures

The QA activities implemented in this program will provide a basis for assessing the accuracy and precision of the analytical measurements. Section 5.8 of this QAPP discusses the QA activity that will generate the accuracy and precision data for each sample type. A generalized form of the equations that will be used to calculate accuracy, precision and completeness follows.

5.12.1 Accuracy

Percent accuracy will be determined using the following equation:

$$\% \text{ Recovery } = \frac{(X - S)}{T} x\ 100$$

where:

X = experimentally determined concentration of the spiked sample
T = true concentration of the spike
S = sample concentration before spiking

5.12.2 Precision

Precision (calculated as percent relative difference) will be determined using the following equation:

$$Relative\ Percent\ Difference\ (RPD) = \left[\frac{(D_1 - D_2)}{\left\{ \frac{D_1 + D_2}{2} \right\}} \right] x\ 100$$

where:

D_1 and D_2 = results of duplicate measurements or standard deviation relative to the average value expressed as relative standard deviation:

Relative standard deviation will be expressed as follows:

$$\text{Relative Standard Deviation (\% RSD)} = = \left\{ \frac{\sigma_{(n-1)}}{\bar{x}\ (x_1 \cdot\cdot x_n)} \right\} x\ 100$$

where:

$\sigma_{(n-1)}$ = standard deviation of the sample data
n = number of replicates
$x_{(x1..xn)}$ = arithmetic mean of the sample data

5.12.3 Completeness

Data completeness is a measure of the extent to which the database resulting from a measurement effort fulfills objectives for the amount of data required. For this program, completeness will be defined as the percentage of valid data for the total valid tests. Completeness is assessed using the following equation:

$$Completeness\ (\%) = \left[\frac{D_r}{D_c} \right] x\ 100$$

where:

D_r = number of samples for which valid results are reported
D_c = number of valid samples that are collected and reach the laboratory for analysis

The completeness objective will help to evaluate the accuracy and precision of the analytical measurements.

5.13 External QA Program

The External Quality Assurance Program includes both performance and system audits as independent checks on the quality of data obtained from sampling, analysis, and data gathering activities. Every effort is made to have the audit assess the measurement process in normal operation. Either type of audit may show the need for corrective action.

5.13.1 Performance Audits

The sampling, analysis, and data handling segments of a project are checked in performance audits. A different operator/analyst prepares and conducts these audit operations to ensure the independence of the quantitative results.

EPA Quality Control concentrates or other standards will be used to assess the analytical work. Results will be reviewed by the subcontractor laboratory and QC personnel. Any additional audit samples presented by the regulatory agencies will be analyzed along with program samples, by the appropriate lab and at the same time as all other samples. It will, however, be the responsibility of the regulatory agency to obtain these samples, and present them to the facility project manager in a form that is amenable and appropriate to the analytical methods being utilized.

If the regulatory agency advises facility program manager that audit results fall outside of acceptable ranges, the analytical data will be further reviewed for error in conjunction with the agency. If a simple, correctable error is found (e.g., an arithmetic error), correction will be made and results resubmitted. If no error is found, an investigation into other causes of the failure (e.g., lack of sample integrity) will be conducted and results evaluated in terms of the impact on sample data integrity.

5.13.2 Corrective Action

The acceptance limits for the sampling and analyses to be conducted in this program will be those stated in the method or defined by the project manager. The corrective actions are likely to be immediate in nature and most often will be implemented by the analyst or Project Manager; the corrective action will usually involve recalculation, reanalysis, or repeating a sample run. Ongoing corrective action policy is described here.

5.13.2.1 Immediate Corrective Action

Specific QC procedures and checklists are designed to help analysts detect the need for corrective action. Often the person's experience will be more valuable in alerting the operator to suspicious data or malfunctioning equipment.

If a corrective action can be taken at this point, as part of normal operating procedures, the collection of poor quality data can be avoided. Instrument and equipment malfunctions are amenable to this type of action and QC procedures include troubleshooting guides and corrective action suggestions. The actions taken should be noted in field or laboratory notebooks but no other formal documentation is required, unless further corrective action is necessary. These on-the-spot corrective actions are an everyday part of the QA/QC system.

Corrective action during the field sampling portion of a program is most often a result of equipment failure or an operator oversight and may require repeating a run. When equipment is discovered to be defective (i.e., pre- and post-sampling leak check) it is repaired or replaced and a correction factor is established as per the EPA method. If a correction factor is unacceptable the run is repeated. Operator oversight is best avoided by having field crew members audit each other's work before and after a test. Every effort is made by the field team leader to ensure that all QC procedures are followed. Economically, it is preferred to repeat a run during a particular field trip rather than return at a later date.

Corrective action for analytical work would include re-calibration of instruments, reanalysis of known QC samples and, if necessary, of actual field samples.

If the problem is not solved in this way, more formalized long-term corrective action may be necessary.

5.13.2.2 Long-Term Corrective Action

The need for this action may be identified by standard QC procedures, control charts, performance or system audits. Any quality problem which cannot be solved by immediate corrective action falls into the long-term category. The condition is reported to a person responsible for correcting it who is part of the closed-loop action and follow-up plan.

The essential steps in the closed-loop corrective action system are:

- Identify and define the problem.
- Assign responsibility for investigating the problem.
- Investigate and determine the cause of the problem.
- Determine a corrective action to eliminate the problem.
- Assign and accept responsibility for implementing the corrective action.
- Establish effectiveness of the corrective action and implement it.
- Verify that the corrective action has eliminated the problem.

Documentation of the problem is important to the system. A Corrective Action Request Form is filled out by the person finding the quality problem. This form identifies the problem, possible causes and the person responsible for action on the problem. The responsible person may be an analyst, field team leader, department QC coordinator or the QA Director. If no person is identified as responsible for action, the QA Director investigates the situation and determines who is responsible in each case.

The Corrective Action Request Form includes a description of the corrective action planned and the date it was taken, and space for follow-up. The QA Director checks to be sure that initial action has been taken and appears effective and, at an appropriate later date, checks again to see if the problem has been fully solved. The QA Director receives a copy of all Corrective Action Forms and then enters them in the Corrective Action Log. This permanent record aids the QA Director in follow-up and makes any quality problems visible to management; the log may also prove valuable in listing a similar problem and its solution.

5.13.3 Quality Assurance Reports to Management

5.13.3.1 Internal Reports

The Laboratory Services Coordinator will prepare a written report on QC activities associated with this project for the Quality Assurance Director. This report will detail the results of quality control procedures, problems encountered and any corrective action, which may have been required.

All Corrective Action Forms are submitted to the QA Officer for initial approval of the corrective action planned and a copy is provided to the Program Manager. All system audit reports are provided to the Program Manager and the Quality Assurance Officer.

5.13.3.2 Reports to Client

The final report will include a section summarizing QA/QC activities during the program. The Project Manager, Laboratory Services Coordinators and the QA Officer will participate in preparing this section. This section will provide summary QA/QC results for method blanks, and laboratory control spike recoveries. This section will evaluate overall data quality in terms of accuracy, precision and completeness. Any discrepancies or difficulties noted in program work, protocol deviations or documentation gaps will be identified and discussed.

Table 5-1 General Sampling and Analytical Program Overview (Stack Exhaust)

Parameter	MACT Emission Limits (a)	Sampling Method	Analytical Method
Flow, Fixed Gases and Moisture	N/A	EPA Methods 2, 3 and 4	N/A
Mercury	130 μg/dscm	EPA Method 29	EPA Method 7471 CVAAS
LVM Metals (As, Be and Cr)	92 μg/dscm	EPA Method 29	EPA Method 6020 ICP-MS
SVM Metals (Cd and Pb)	230 μg/dscm	EPA Method 29	EPA Method 6020 ICP-MS

Table 5-2 QA Objectives for Field Measurements

Field Measurement	Accuracy	Precision	Completeness
Moisture (EPA Method 4)	**(a)**	± 20%	100%
Carbon Dioxide (EPA Method 3 – Orsat Analysis)	**(b)**	**N/A**	100%
Oxygen (EPA Method 3 – Orsat Analysis)	**(c)**	**N/A**	100%

(a) Not determinable.

(b) An accuracy of ± 0.2% would be expected if a certified gas audit is performed. Otherwise individual readings must be within 0.3 g/g-mole of the mean value for three (replicate) readings.

(c) An accuracy of 20.8% ± 0.5% would be expected if an ambient air audit is performed.

Table 5-3 Overall Summary of Performance Test Stack Gas Sampling and Analysis Program

Sample Matrix and Sampling Method	Analytical Parameters	Analytical Method	Lab (a)	Total Samples Analyzed				
				Total Runs	Field Blanks	Audit	Lab QC	Total
EPA M 29	Metals (b)	EPA M 6010B/6020/7000	MAX	3	1	0	1	5
EPA M 3	O_2 and CO_2	EPA M 3 (Orsat)	ENSR	3	0	0	0	3
Facility CEM	O_2 and CO	Facility CEM QA Plan	Veolia	3	0	0	0	3

(a) MAX = Maxxam Analytical, Burlington, Ontario
Veolia = Veolia ES Technical Solutions

(b) Target metals include : arsenic, beryllium, cadmium, chromium, lead and mercury

Table 5-4 Traverse Point Locations

STACK INSIDE DIAMETER:	39	inches
SAMPLING LOCATIONS:	9.85 15.1	diameters downstream diameters upstream
MINIMUM NUMBER OF TRAVERSE POINTS AS SPECIFIED BY EPA METHOD 1:	12	
NUMBER OF TRAVERSE POINTS SAMPLED:	12	

Traverse Point Number	Percent of Stack Diameter From Inside Wall	Distance in Inches From Inside Wall
1	95.6	37.3
2	85.4	33.3
3	70.4	27.5
4	29.6	11.5
5	14.6	5.7
6	4.4	1.7

Table 5-5 Sample Preservation and Holding Time Requirements

Stack Gas Samples [a]

Parameter	Matrix	Preservation	Holding Time
Metals (Method 29) (except Hg)	Aqueous	Cool, 4°C	6 months
	Solid / Filter	Cool, 4°C	6 months
Mercury (Method 29)	Aqueous	Cool, 4°C	28 days
	Solid/Filter	Cool, 4°C	28 days
(a) Holding times will be calculated from the day of sample collection.			

Table 5-6 QA Requirements for Metals in Stack Gas by ICAP or ICP-MS

Quality Parameter	Method Determination	Frequency	Target Criteria
Calibration	Initial analysis of standards	Daily	Analysis of calibration check standard within 10% of true value
	Continuing mid-range calibration standard	At least once before and after sample analysis	90-110%
	Continuing calibration blank	With continuing calibration standard	Subject to interpretation
Accuracy - ICV	Analysis of calibration check standard	After every initial calibration	90% to 110% of true value
Accuracy - filters	Analysis of NIST standard reference filters or EPA audit filters, if provided	Once per test	70% to 130% of reference value
Accuracy	Post-digestion spikes	Once per test	70% to 130% recovery
Precision	Post-digestion spikes	Once per test	RPD < or = 35%
Blanks	Field Reagent Blanks and Method Blanks	One each per test	Evaluated on case by case basis

RPD = Relative Percent Difference

ICAP = Inductively Coupled Argon Plasma

ICP-MS = Inductively Coupled Plasma – Mass Spectrometry

ICV = Initial Calibration Verification

Figure 5-1 Stack Sampling Locations

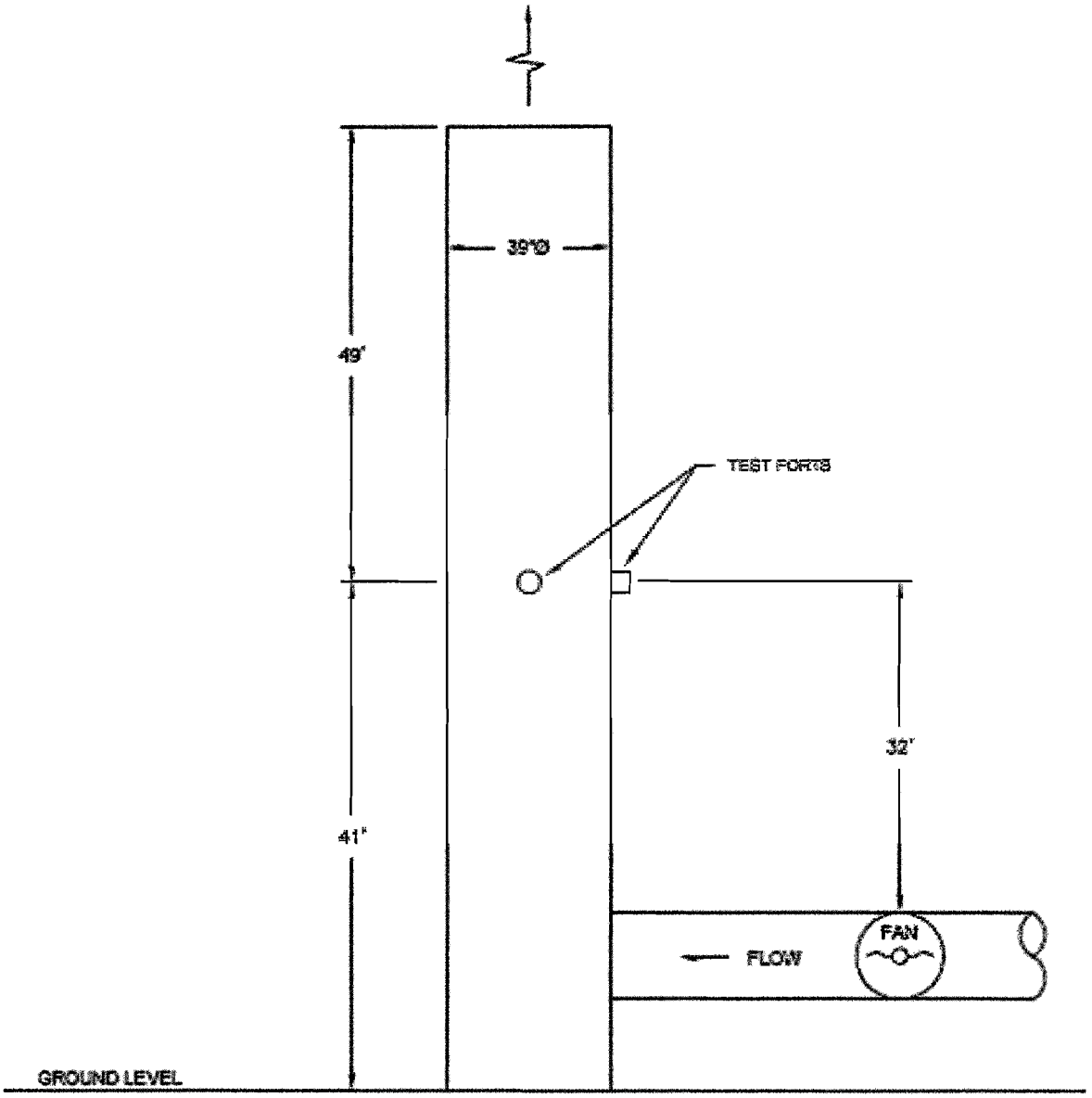

Figure 5-2 Example Sample Packing List

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SAMPLE PACKING LIST

Page ___ of

Project Site:	**Sample Date :**	**Project Location:**	**P.O. #**
Program Type:	**Date Shipped :**	**Laboratory:**	
Project No. :	**Cooler No. :**		
ENSR Office : WESTFORD	**DOT Box No. :**		
ENSR Contact : Doug Roeck	**Signature :**	**FedEx Airbill No. :**	

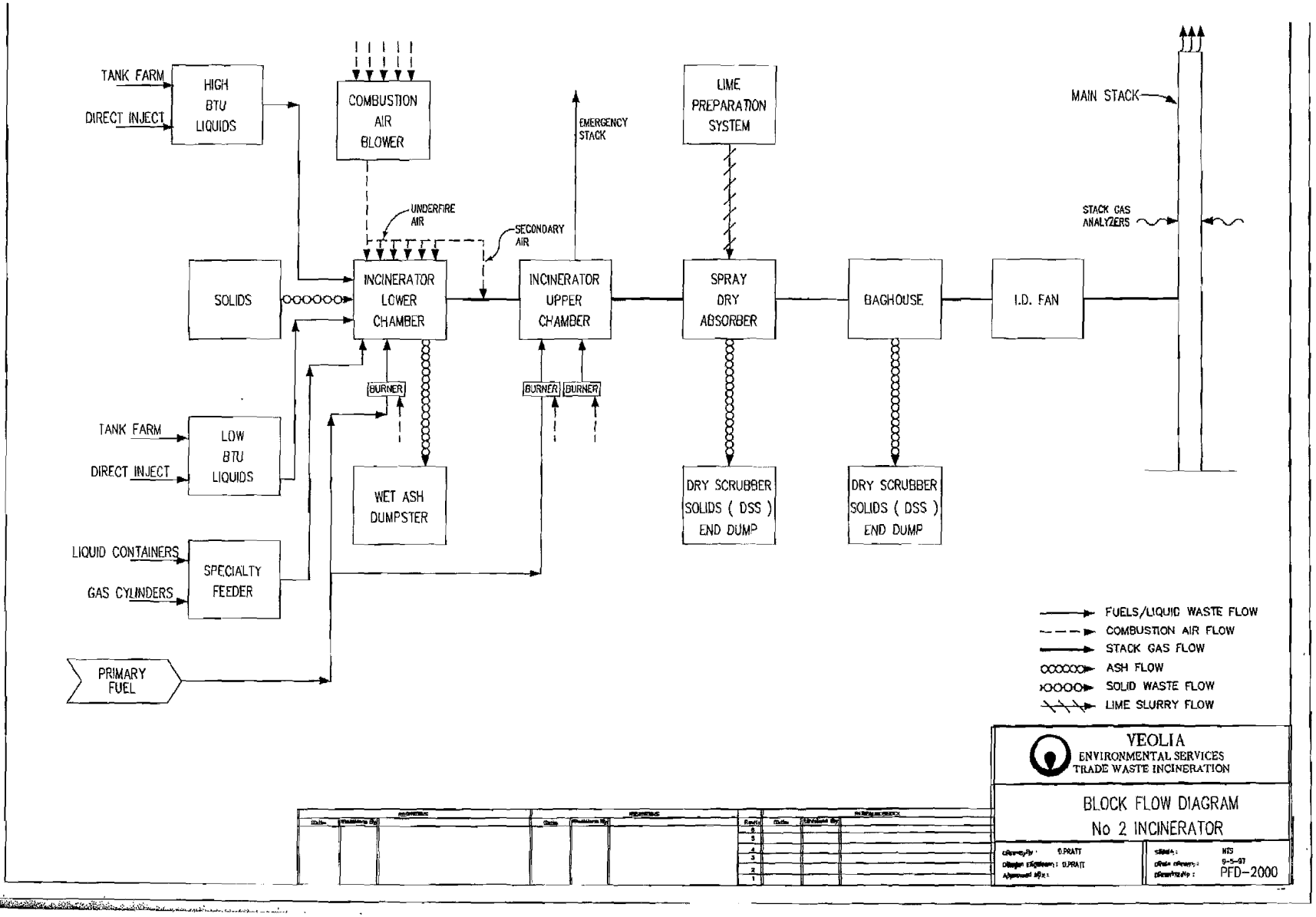
Item	Sample ID	Matrix	Description	Analytical Parameters	Instructions

Field Notes / Comments:
(1) Please return this form with analytical results.

Relinquished by (Print)	Date:	Received by (Print)	Date:	**Analytical Laboratory:**	
Signature:	Time:	Signature:	Time:		
Relinquished by (Print)	Date:	Received by (Print)	Date:	Received by:	Date:
Signature:	Time:	Signature:	Time:	Signature:	Time:

Appendix A

Unit 2 Process Flow Diagram


TANK FARM
DIRECT INJECT
HIGH BTU LIQUIDS
COMBUSTION AIR BLOWER
EMERGENCY STACK
LIME PREPARATION SYSTEM
MAIN STACK
UNDERFIRE AIR
SECONDARY AIR
STACK GAS ANALYZERS
SOLIDS
INCINERATOR LOWER CHAMBER
INCINERATOR UPPER CHAMBER
SPRAY DRY ABSORBER
BAGHOUSE
I.D. FAN
BURNER
BURNER
BURNER
TANK FARM
DIRECT INJECT
LOW BTU LIQUIDS
WET ASH DUMPSTER
DRY SCRUBBER SOLIDS (DSS) END DUMP
DRY SCRUBBER SOLIDS (DSS) END DUMP
LIQUID CONTAINERS
GAS CYLINDERS
SPECIALTY FEEDER
PRIMARY FUEL
FUELS/LIQUID WASTE FLOW
COMBUSTION AIR FLOW
STACK GAS FLOW
ASH FLOW
SOLID WASTE FLOW
LIME SLURRY FLOW
VEOLIA
ENVIRONMENTAL SERVICES
TRADE WASTE INCINERATION
BLOCK FLOW DIAGRAM
No 2 INCINERATOR
D.PRATT
D.PRATT
NTS
9-5-97
PFD-2000

Appendix B

Field Data Sample Collection Forms

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EPA ISOKINETIC SAMPLING - FIELD DATA SHEET

Sampling Train ______________________
Run Number ______________________
Client ______________________
Facility Location ______________________
Source ______________________
Date ______________________
Operator ______________________
Stack Dia. - in. ______________________
Start Time ______________________
Stop Time ______________________

Barometric Pressure ____________
Static Pressure (+/-) ____________
Probe/Pitot Nnmber ____________
Pitot Coefficient ____________
Filter Box No. ____________
Meter Box No. ____________
Orifice Coefficient (Y) ____________
Delta H @ ____________
Nozzle Size/No. ____________
XAD Thermocouple ID: ____________
Imp Outlet TC ID:

LEAK CHECKS in "Hg
INITIAL VAC. ________ in. CFM ________
MID VAC. ________ in. CFM ________
FINAL VAC. ________ in. CFM ________
\+ - \+ -
INIT. PITOT ________ FINAL PITOT ________

FILTER DATA

NUMBER	TARE

IMPINGER VOL'S

INIT.	FINAL	RINSE

SILICA GEL	

Final Purge Rate ____________
Final PH

Orsat

CO2	O2

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD DeltaP, in wc	ORIFICE METER VOL. DeltaH, in wc	GAS METER VOLUME ft³	TEMPERATURE READINGS, °F: STACK	PROBE	OVEN	ORGANIC MODULE	IMPINGER	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	COMMENTS

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ORSAT ANALYSIS (EPA METHOD 3)

PLANT :	**PRE-LEAK CHECK :** ______________
DATE :	**POST-LEAK CHECK :** ______________
LOCATION :	**NOTE:**
SAMPLE TYPE :	Valid Leak Check : Liquid level must not fall below bottom of capillary tubing in 4 minutes
OPERATOR :	and meniscus must not change by more than 0.2 mL in 4 minutes.

NOTES / DATA CRITERIA --

CO_2 : When greater than 4%, difference between readings shall be 0.3% or less.
When less than 4%, difference between readings shall be 0.2% or less.

O_2 : When greater than or equal to 15%, difference between readings shall be 0.2% or less.
When less than 15%, difference between readings shall be 0.3% or less.

Test Condition:

Run:	Reading A		Reading B		Reading C		Avg.
GAS	Actual	Net	Actual	Net	Actual	Net	Net Volume
CO_2							
O_2 *							

Run:	Reading A		Reading B		Reading C		Avg.
GAS	Actual	Net	Actual	Net	Actual	Net	Net Volume
CO_2							
O_2 *							

Run:	Reading A		Reading B		Reading C		Avg.
GAS	Actual	Net	Actual	Net	Actual	Net	Net Volume
CO_2							
O_2 *							

* Net O_2 is actual O_2 minus actual CO_2 reading.

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SAMPLE TRAIN MOISTURE RECOVERY DATA SHEET

Reference Method / Sampling Train :											
Recovered by :				**Recovered by :**				**Recovered by :**			
Run No. **Date :**				**Run No.** **Date :**				**Run No.** **Date :**			
Filter No. :				**Filter No. :**				**Filter No. :**			
Impinger No. and Volume				**Impinger No. and Volume**				**Impinger No. and Volume**			
No.	Initial (mL)	Final (mL)	Rinse (mL)	No.	Initial (mL)	Final (mL)	Rinse (mL)	No.	Initial (mL)	Final (mL)	Rinse (mL)
1				1				1			
2				2				2			
3				3				3			
4				4				4			
5				5				5			
6				6				6			
7				7				7			
			DIFF :				**DIFF :**				**DIFF :**
Totals				**Totals**				**Totals**			
	Initial (g)	Final (g)	**DIFF :**		Initial (g)	Final (g)	**DIFF :**		Initial (g)	Final (g)	**DIFF :**
Silica Gel				Silica Gel				Silica Gel			
Final Net Moisture Gain:				**Final Net Moisture Gain:**				**Final Net Moisture Gain:**			

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NOZZLE CALIBRATION FORM

Client: _____ Project #: _____

Date: _____ Calibrated by: _____

Nozzle ID #	D_1, in.	D_2, in.	D_3, in.	Delta D, in.	D_{avg}, in.

Where:

$D_{1,2,3}$ = Nozzle diameter measured on a different diameter to the nearest 0.001 in.

Delta D = Maximum difference between any two measurements, in.
Tolerance = 0.004 in.

D_{avg} = Average of $D_{1,2,3}$

Appendix C

Isokinetic Sampling Train Setup and Recovery Schematics

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SAMPLE TRAIN SETUP
MULTIMETALS
(as Per EPA Method 29 / 0060)

IMPINGERS --

1st		empty *
2nd	--	100 mL 5% HNO_3 / 10% H_2O_2
3rd	--	100 mL 5% HNO_3 / 10% H_2O_2
4th	--	empty
5th	--	100 mL 10% H_2SO_4 / 4% $KMnO_4$
6th	--	100 mL 10% H_2SO_4 / 4% $KMnO_4$
7th		Silica Gel

FIELD BLANKS -- (Exact Volumes Specified by Method)

0.1 N HNO3	--	300 mL
5% HNO_3 / 10% H_2O_2	--	200 mL
10% H_2SO_4 / 4% $KMnO_4$	--	100 mL
DI Water	--	100 mL
8 N HCl	--	25 mL (added to 200 mL water)
Filter	--	One unused filter

* optional - used for high moisture stacks

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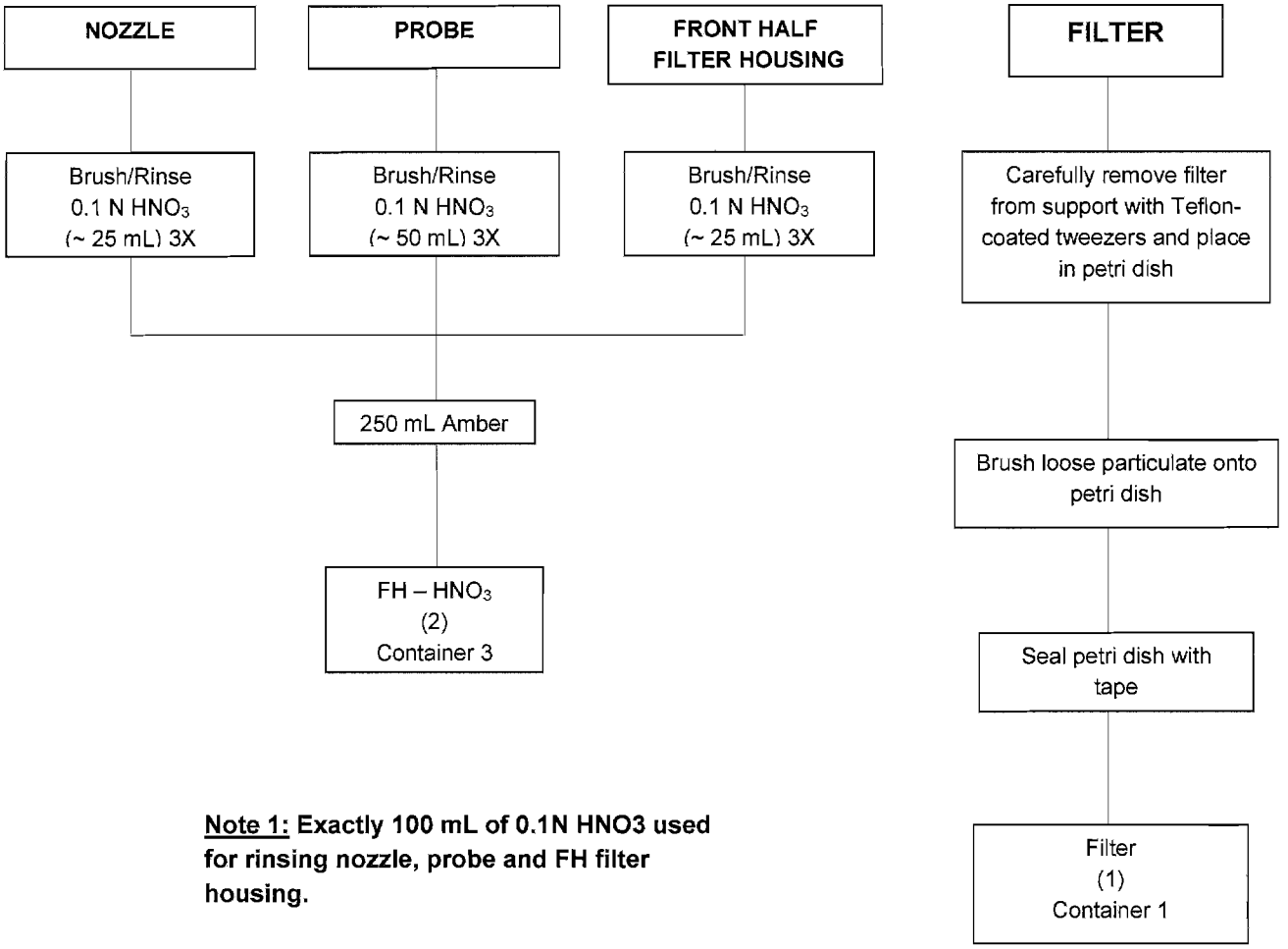

Note 1: Exactly 100 mL of 0.1N HNO3 used for rinsing nozzle, probe and FH filter housing.

Note 2: Nozzle, probe and FH filter housing are rinsed with water followed by acetone after the nitric acid rinse. The water and acetone are then discarded.

METHOD 29 (METALS) RECOVERY SCHEMATIC – FRONT HALF RECOVERY

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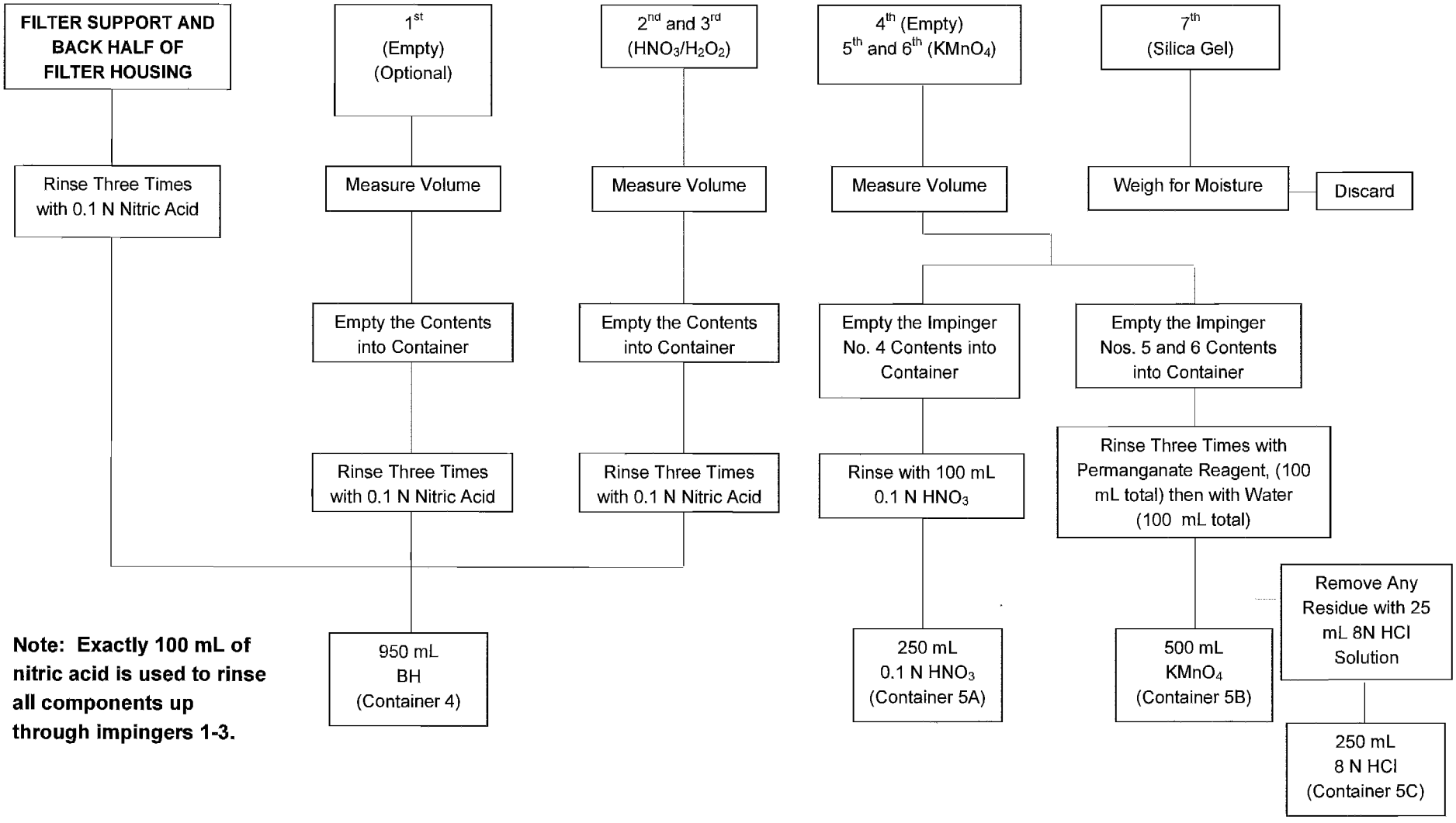
IMPINGERS



Note: Exactly 100 mL of nitric acid is used to rinse all components up through impingers 1-3.

METHOD 29 (METALS) RECOVERY SCHEMATIC – BACK HALF RECOVERY